PREDATOR: RC WEAPON OF WAR

MODEL Airplane NEWS

EXTEND ENGINE LIFE!

10 TIPS YOU MUST KNOW

Easy-flying vintage ARFs

Great Planes **Tiger Moth**
Global **Fokker D-VII**

Build a twin electric fighter-bomber

WE TEST FLY

Majestic—ARF aerobat
Mini Milan—slope sailplane
Kellett—scale autogyro

HOW TO

Scale fuselage design techniques

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MARCH 2002

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MODEL Airplane NEWS

MARCH 2002 VOLUME 130, NUMBER 3

ON THE COVER: *the Great Planes de Havilland Tiger Moth is a sedate flyer that looks terrific on the wing. See Jim Onorato's review on page 52 (photo by Walter Sidas). Inset—what's it like to fly the ultimate RC aircraft? We have the inside scoop on the Predator on page 28.*

FEATURES

28 The Predator
The ultimate radio control aircraft
by Gerry Yarrish

86 Deelen Scale Meet
Dutch tribute to giant scale
by Dick van Mourik

92 Extend Engine Life
Helpful tips to keep your powerplant happy!
by the staff of Model Airplane News

HOW TO
106 Shear Webs Made Easy
A quick way to add strength to your wing
by John Tanzer

CONSTRUCTION

76 Westland Whirlwind
Distinctive British fighter-bomber for twin Speed 400s
by Mark Rittinger

FLIGHT TESTS

KYOSHO
36 Majestic 1400 ARF
Award-winning pattern plane
by Jim Onorato

GLOBAL
42 Fokker D-VII
Sport-scale WW I fighter ARF
by Bob Van Tassel

GREAT PLANES
52 Tiger Moth ARF
1/5-scale timeless trainer
by Jim Onorato

AUTOGYRO CO. OF ARIZONA
60 Kellett YG-1B Autogyro
Golden Age wingless wonder
by Richard Anderson

MULTIPLEX USA
68 Mini Milan
Slope-soaring aerobat
by Richard Loud

COLUMNS

14 Air Scoop
by Chris Chianelli and the staff of Model Airplane News

100 Scale Techniques
Fuselage structures and construction
by Dick van Mourik

122 Backyard Flyer
Be the neighborhood jet-jock
by Chris Chianelli

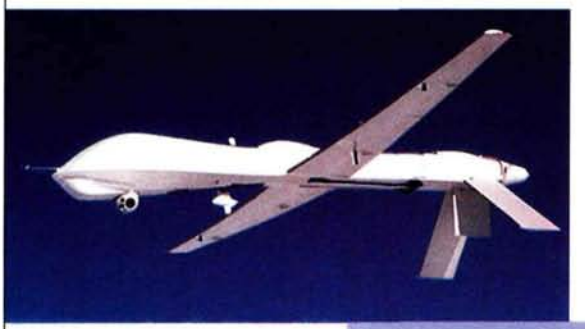
154 Final Approach
NASA's inflatable wings
by Matt Boyd

DEPARTMENTS

10 Editorial
12 Airwaves
20 Tips & Tricks
24 Pilot Projects
114 Product Watch
136 Name that Plane
138 Classifieds
145 RCStore.com
153 Index of Advertisers
153 Customer Service

The ultimate RC aircraft

A highly evolved relative of our RC models, remotely piloted military aircraft such as the U.S. Air Force Predator are on center stage in Operation *Enduring Freedom* in Afghanistan, successfully completing their missions while keeping pilots and support troops out of harm's way. Many generations away from the RC target drones of the 1940s, these UAV aircraft are capable not only of sophisticated surveillance but also of firing missiles and destroying targets. Like modelers everywhere, we wondered what it must be like to work with and pilot the ultimate RC aircraft, so senior tech editor Gerry Yarrish decided to find out. In an up-close look at the behind-the-scenes operations of the Predator, he shares what he learned from interviews with an Air Force commander in charge of a UAV squadron. In which ways are preparing and flying the Predator like piloting a large RC model? You may be surprised by the answers; check out our inside story on page 28.



Getting the most power, reliability and longevity from our engines is a goal we all share.

On page 92, we offer 10 trouble-shooting tips to properly care for and maintain your engine. From using the right glow plug to achieving the best air/fuel mixture to correctly positioning your fuel tank, we show you how to keep your engine performing at peak efficiency.

One of the most interesting components of model airplane design is choosing your construction method. In this month's "Scale Techniques," guest columnist Dick van Mourik discusses various fuselage construction techniques for saving weight while increasing strength. Girder and stick construction, traditional former layout and half-shell building techniques all fit a specific need, and knowing which to use is the first step toward success. Whether you'd like to design a small electric warbird, a .40-size sport flyer, or a giant-scale aerobat, Dick's article will help you more easily choose the construction method that's just right for your project.

And before you start building your model's wings, check out John Tanzer's "how to" on a quick and easy way to make identical shear webs. Add strength to your wing while saving time; see page 106.

Do you like vintage biplanes? This month, we review two classics: a Global Fokker D-VII and a Great Planes Tiger Moth. Easy to assemble, these almost-ready-to-fly planes offer gentle performance that complements their good looks.

Our featured construction article is a twin electric, WW II warbird designed by Mark Rittinger. A model of an unusual fighter, the Westland Whirlwind has a 42-inch wingspan and uses two Speed 400 motors for power. With a low parts count and traditional balsa construction, this plane will practically fly off your workbench!

MODEL Airplane NEWS
FOUNDED 1929

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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

ZLÍN FAN

My interest in Zlín aircraft began a decade ago when I first read the late Neil Williams' book, "Aerobatics." This was several years after the world champion's heyday in competition and his untimely death. Mr. Williams took on the world's best fliers in the Zlín 526. His accomplishments and feats of flying skill are material enough for a book of their own.

Having established that I'm somewhat biased, I believe the Zlín 526 AS shown in the January 2002 issue and designed and built by Dick van Mourik is simply the most beautiful flying model I have ever seen. He has brilliantly re-created the thoroughbred in tremendous detail. I was especially impressed that he detailed the automatic-pitch-change propeller (that's why there are fins on the spinner). Good show, Mr. van Mourik; you captured the essence of a fine airplane.

BRIAN VEAZEY
ALEXANDRIA, VA

Thank you very much for your kind comments; I'm glad you liked the article! I fully agree that Zlíns have this character which many other aerobatic aircraft lack. Because of a photograph I saw in one of my father's books, my love affair with the aircraft started when I was a little kid. I've been lucky enough to build my models from factory-construction drawings (since building the Z-526 AS, I've specialized in Zlíns). They don't guarantee perfection, but they at least provide the optimum information available. Over the years, the folks at the factory have been most helpful, and that enabled me to carry out the detailing to the extent shown on the model. I'm now working on two Z-50s, an LS and an M version, with a longer nose; these are "full-glass" jobs. The next project will be a Z-XII, and then I plan to start on either a Z-26 in steel-tube construction or a Z-XV, but I assume that will not happen for five to seven years. It's always good to have something in the pipeline! Again, thank you very much for your interest.

DICK VAN MOURIK

HAFFKE DESIGNS

Thanks to Henry Haffke for his rendition of the unique and well-thought-out Bunting racer detailed in the construction article in the February 2002 issue. I'm certain that he has designed numerous other models; do you sell other plans by him? [email]

HOWARD CHESTER

We're also thankful that Henry has graced Model Airplane News *with his terrific model designs since 1979. Other Haffke plans we offer include the 56-inch-span Howard Ike (FSP04791) and Peashooter (FSP08871), a 51-inch-span Time Flies (FSP08851), a 58-inch, stand-off-scale Gentle Gee Bee (FSP12941), an 82-inch Giant Peashooter*

(FSP09951) and a 66-inch Ryan ST (FSP11991). You can order any of these from www.rcstore.com or turn to page 147 for the order form. DS

FUELIN' UP

I'm completing my first scale project, a 60-size Corsair, and I have a small problem with the fuel-tank setup. I use an easy fueler, and my engine is completely concealed in the cowl. Should I use a two- or three-line setup for the tank? If I use a three-line setup, where do I direct the overflow tube for fueling the model? In short, how do I configure my fuel-tank setup? Thanks for your help. [email]

LES RADFORD

Les, I recommend that you use a three-line system and eliminate the easy fueler so you'll have fewer connections in your fuel system. The third line makes fueling very simple. You won't have to worry about directing the fuel overflow tube because when the tank is full, any excess fuel will automatically exit through the pressure line and then out through the muffler. Just be sure to plug the third line after fueling; otherwise, you'll have a lean run. Good luck with your project, and please send us a photo for "Pilot Projects." GY

SIX-BOLT PROP HUBS

For years, I've seen ads for engines such as the 3W and others (and now a new one, the ZDZ 40 RV-L, discussed in your December 2001 issue), that require the prop to be attached with six bolts. I have never seen one of these props advertised in any model magazine, nor have I ever seen one in a hobby shop. I assume that the engine comes with a jig that allows you to drill the extra holes in a regular prop. If it isn't done correctly, it seems to me that this would seriously weaken a prop, and we don't all own a drill press. I've noticed that some folks who compete use these engines, and the pictures of 3W engines indicate that they are nicely made. I can't recall, however, reading an article that discusses how these multi-bolt props are attached to engines. Could you folks enlighten us on this subject? [email]

BILL THOMPSON

Most companies that sell engines with six-bolt prop hubs, offer drilling jigs (though most engines do not come with a jig). It is fairly easy to drill the prop for six bolts. It is, however, a requirement that you have a drill press to drill the prop holes accurately. Without one, the holes in the prop will not line up with the hub attachment holes. Most modelers use the prop washer as a jig, and this does come with the engine. It's made of aluminum, however, so it is fairly easy to elongate the holes in the washer; be very careful if you use the washer as a guide.

To help align the bolt holes with the hub, I use the next larger size drill bit when I drill a prop hole. This way, there is a little "cheat" space, and the prop remains properly aligned. I will consider addressing this topic in a future "Thinking Big" column. Thanks for your comments. GY

AIR SCOOP

by Chris Chianelli and the staff of Model Airplane News

NEW PRODUCTS OR PEOPLE behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

HANGAR 9

CLIPPPED-WING

Taylorcraft

This ¼-scale Taylorcraft ARF is truly one of a kind because it's a replica of a one-of-a-kind, full-scale airplane built by renowned aircraft restoration expert Jim Moss. The 85-inch-wingspan model comes covered in Ultracote and weighs between 13 and 15 pounds. Its pleasing flight characteristics and great scale appearance are sure to catch the eyes of 3D and sport pilots alike. It sells for $379.95 and uses a 1.20 to 1.50 4-stroke or a G23 for power.

Hangar 9; distributed by Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 352-6799; www.horizonhobby.com.

GRAUPNER

TIPSY

Even though it's designed specifically with beginners in mind, the great flight characteristics of the new Graupner Tipsy will lure even the most experienced modelers. Constructed of molded foam with a one-piece wing, the Tipsy weighs 11 ounces and has a 35-inch wingspan. It has rudder, elevator and throttle control, and all of the necessary hardware is included in the kit. It's also available as a complete package with a motor, prop, speed control and battery combination specially made for the Tipsy to produce slow, stable flights that allow it to be flown in smaller areas. The Tipsy kit costs $49; the ready-to-fly version is $255.

Graupner; distributed by Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948; www.hobby-lobby.com.

GREAT PLANES

ElectroStreak ARF

For more than a decade, experienced pilots looking for a sporty, electric aerobat have turned to the Great Planes ElectroStreak. Well, Great Planes has now improved the appeal of this already popular design by offering it in an almost-ready-to-fly (ARF) version. The ElectroStreak ARF features a four-color trim scheme that will really turn heads at the flying field, and the best part is that it can be flight-ready in just 8 to 10 hours. This 44½-inch-wingspan model has a gelcoated, fiberglass fuselage and comes with nearly everything you'll need to get it into the air, including a 550 motor, a spinner, an 8x5 folding prop, an electronic speed control with BEC and all of the necessary hardware. It sells for $139.99.

Great Planes Model Mfg. Co., P.O. Box 9021, Champaign, IL 61826; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.

DYMOND MODELSPORTS USA LTD.

Blitz Flying ARF

Whether you're looking for a simple slope plane or a motorized aircraft with a unique design, Dymond's new Blitz ARF fills the bill. This 81-inch-wingspan model has a detachable motor mount for easy transition from power to slope. If it's power you want, this balsa- and ply-constructed aircraft will accommodate geared or direct-drive Speed 540 to 600 motors. It comes already covered and hinged, and the wings are detachable for easy transportation. The Blitz sells for $79.95.

Dymond Modelsports USA Ltd., 683 N. Main St., Oshkosh, WI 54901; (920) 303-1100; fax (920) 303-2021; www.rc-dymond.com.

WATTAGE

Lightning

You don't even have to leave your house to learn how to fly the new Lightning from WattAge. Constructed of molded plastic and foam, the Lightning comes with a transmitter that not only provides control but also functions as a portable battery charger, a display stand and a training stand flight simulator. Simply turn the transmitter on and arm the Lightning's motor switch to practice throttle and steering control. The Lightning also features thrust vector control, an automatic climb mode and functional landing gear. It weighs less than 3 ounces and sells for $79.99.

WattAge; distributed by Global Hobby Distributors, 18480 Bandilier Cir., Fountain Valley, CA 92708; (714) 963-0133; fax (714) 962-6452; www.globalhobby.com.

JR

NEW DIGITAL SERVO

If you're an aerobatic plane or helicopter pilot, precision control is as important to you as oxygen. For years, giant-scale aerobatic fliers have turned to the JR 8411 digital servo for their aircraft, and now it's even better. When world champion helicopter pilot Curtis Youngblood retrofit his 8411's alloy gear train with a nylon gear train (except for the final output gear), the folks at JR recognized his genius; the result is the new 8411SA. It instantly tracks the subtlest command changes and holds them with precision, with zero backlash or deadband. Pick one up and get ready to steal the show at your next competition. Pricing is not yet available.

JR; distributed by Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 352-6799; www.horizonhobby.com.

CYBERBOND

CYBERFOAM

Looking for an adhesive that's specifically designed to bond balsa and foam? Check out Cyberbond's new Cyberfoam adhesive. This solvent-free solution securely bonds balsa skins to foam-cores with a foaming action that penetrates every grain and pore to create one of the strongest bonds possible. Cyberfoam also bonds foam to foam and wood to wood, and it is completely sandable. Best of all, Cyberfoam cures in just 4 hours! A 5-ounce container costs $6.79; 16 ounces is $16.79.

Cyberbond LLC, 401 N. Raddant Rd., Batavia, IL 60510; (630) 761-8900; fax (630) 761-8989; www.cyberbond1.com.

D&L DESIGNS

DALOTEL DM-165 VIKING

If you like the design of the Dalotel DM-165 Viking on paper, you're going to love it in the air. Previously sold as a plan only, D&L Designs now offers the model in an almost-ready-to-cover (ARC) and two almost-ready-to-fly (ARF) versions (shown). Constructed of balsa, ply and spruce, and covered with MonoKote, the Viking features a fiberglass cowl, a molded canopy, landing gear, wheels and hardware. With a .45 to .61 2-stroke or .53 to .70 4-stroke engine, the Viking has a wide speed envelope and is capable of precision aerobatics. The Viking has a 59.9-inch wingspan and weighs 6½ pounds. The ARC version costs $219.95; the ARF sells for $269.95.

D&L Designs, 1145 E. Kleindale Rd., Tucson, AZ 58719; (520) 887-0771; dldesigns@mindspring.com; www.dldesigns.net.

ESPRIT MODEL

New line of park flyers

It's time to make some room in your hangar for a whole new line of park flyers. Esprit is now importing high-quality, low-price models, such as the ARF StarTL96 and Vilik, shown here, from the Czech Republic. The 42½-inch-wingspan Star has a balsa wing and tail feathers, a gelcoated fiberglass fuselage and a Solarfilm covering. It's powered by a Speed 280 motor with a 1:4 gearbox and weighs only 15 ounces. The Star sells for $90.

Designed specifically to fly in confined spaces, the Speed 280-powered Vilik is constructed entirely of balsa and covered in Solarfilm. The 44½-inch-wingspan model comes complete with the motor and 4:1 gearbox, a scale pilot and a prop. On a 7-cell, 700mAh battery, the Vilik is capable of 20-minute flights, and its deep profile wing ensures that it's extremely stable, even at low speeds. The Vilik is also priced at $90.

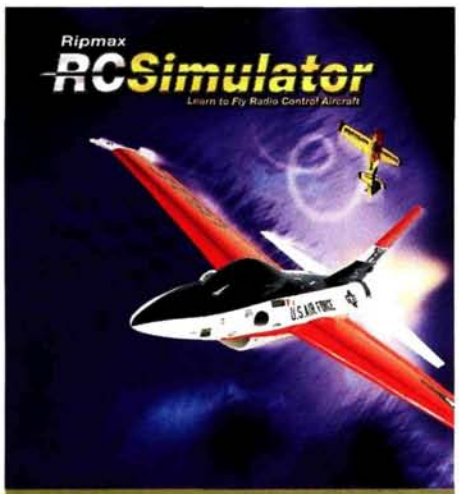
Esprit Model, 657 Worcester St., #902, Southbridge, MA 01550; prop.rc@verizon.net; www.espritmodel.com.

BOB HOLMAN PLANS

Buccaneer

Take a trip back in time with this 36-inch-span Buccaneer from Bob Holman Plans. Bob offers both the plan and the laser-cut parts for this 1940s classic model. The Buccaneer is capable of being powered by any number of modern small glow engines or electric motors. Plans are also available for rubber-band-powered models. The plans sell for $8, and the laser-cut parts are $15 plus $4 for postage.

Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402; (909) 885-3959; fax (909) 889-9307; bhplans@aol.com; www.angelfire.com/ct/bhplans.

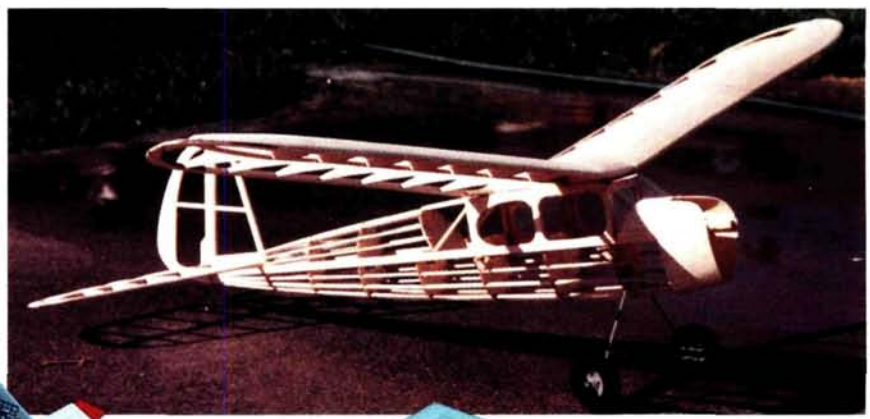


RIPMAX

RC Flight Simulator

This new flight sim from Ripmax has plenty of options, including 10 aircraft that you can customize, 10 flying fields, step-by-step flight-school training and interactive games such as "Limbo" and "Pylon Racing." The program can be quickly loaded, is easy to use and supports all major 3D cards. It's also available with a special interface that allows you to use your own transmitter. The Ripmax RCSimulator costs $79.99; with the interface, it's $109.99.

Ripmax; distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826; (800) 682-8948; fax (217) 398-0008; www.greatplanes.com.



CAVAZOS SAILPLANE DESIGN

In the News

If you're into slope sailing, we have some news for you: Cavazos Sailplane Design (CSD) has acquired the complete line of Slope Scale Models. Each basic kit comes with a glass fuselage, blue foam-wing cores, instructions and plans. Full kits also come with all of the necessary wood and hardware. Here's the best part: CSD will offer each 46-inch-wingspan model in both slope and electric versions. Electric models will come as full kits only, with lighter fuselages and included mounting trays for the motor, batteries and radio gear. Available models include a BD-5 (shown), a Spitfire, a P-51, a P-40 Warhawk, a Hellcat and many more.

Cavazos Sailplane Design, 2901 Foreman Ave., Moreno Valley, CA 92553; (909) 485-0674; www.rcglider.com.

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

WATER SUPPLY

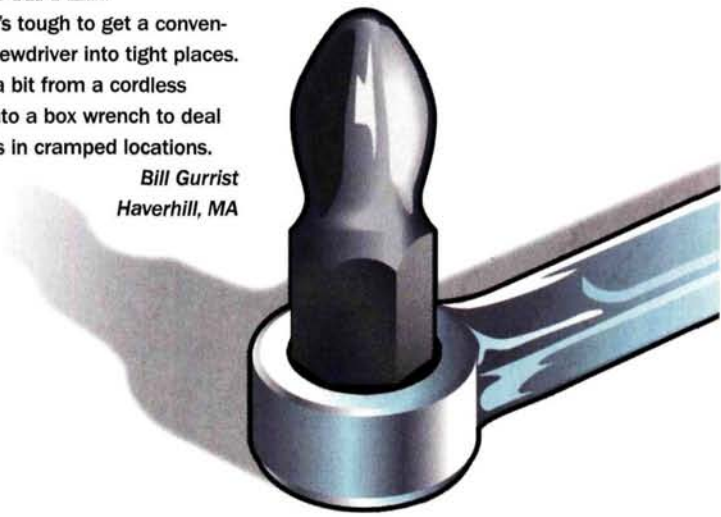
If you use water-based paint in your airbrush, keep one of those sport bottles of water (the ones with the flip-up straws) at your workbench. Modify the straw to fit inside the bottle inlet, and you'll never have to get up for water again.

Ben Broderick
[email]

SHORTY SCREWDRIVER

Sometimes it's tough to get a conventional-size screwdriver into tight places. Try inserting a bit from a cordless screwdriver into a box wrench to deal with fasteners in cramped locations.

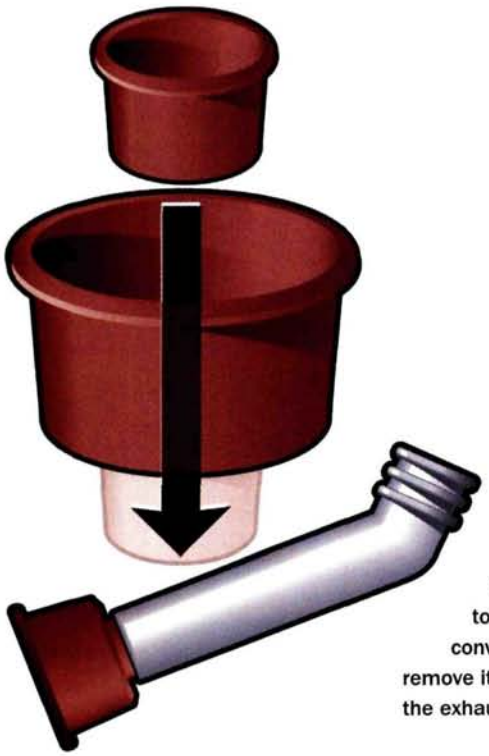
Bill Gurrist
Haverhill, MA



POSITIONING WIRES IN PARK FLYERS

The space inside the radio compartments of some of today's small park flyers is very tight, and that makes it difficult to arrange servo leads, battery and motor wires. To move wires where your fingers can't reach, cut a notch of the appropriate size and shape for your wires in the end of a Popsicle stick. Hook the wires in the notch, and use the stick to push them back into the fuselage where they won't be in the way.

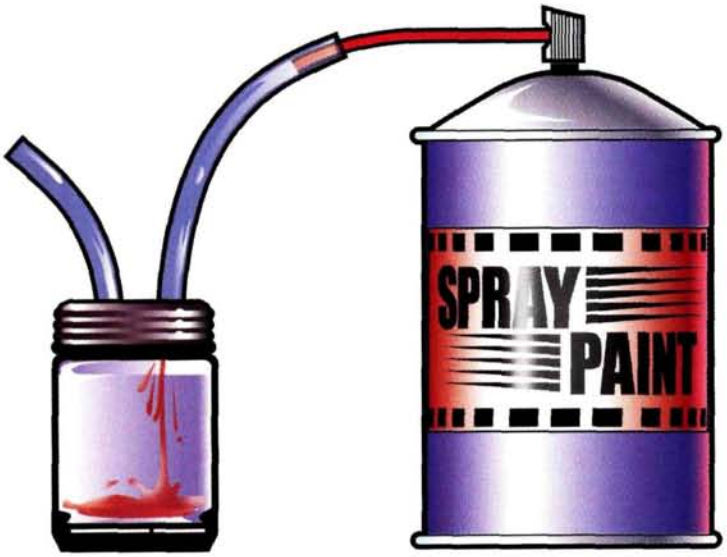
Bill Sweet, Troy, NY



EXHAUST CAP

During operation, unburned fuel and oil collect in your muffler and exhaust extension and can dribble out at an inconvenient place and time—such as on your workbench or on your car's upholstery while you're driving home from the field! To prevent this, make an exhaust plug; the red plastic cap that comes on 1-gallon fuel jugs works well. Cut a hole in the center of the red cap to fit a piece of rubber or cork of the appropriate size for your exhaust outlet. The red cap makes a convenient grip for placing the plug in a hot exhaust pipe, and it is easy to see so you won't forget to remove it during startup. Even if you do forget, unlike wooden plugs, it's light enough to be blown clear by the exhaust flow.

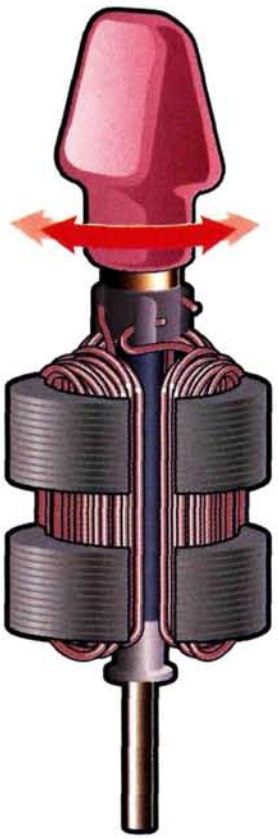
Dave Seale, Dedham, MA



TOUCHUP IN A CAN

Eventually, almost any model's finish will need touching up, and if you originally used spray cans to paint it, getting the paint out of the can for fine details can be messy. Next time, try this simple trick. First, borrow the thin, straw spout from a can of WD-40, carb cleaner, or other aerosol can that comes with a spout. Next, in the screw top of a small glass jar, cut a hole just big enough to thread a length of silicone fuel tubing through. Insert the straw spout into the fuel tubing and start spraying; your touchup paint will collect in the jar without any mess or overspray. Then, just unscrew the top and use a brush to restore a like-new finish.

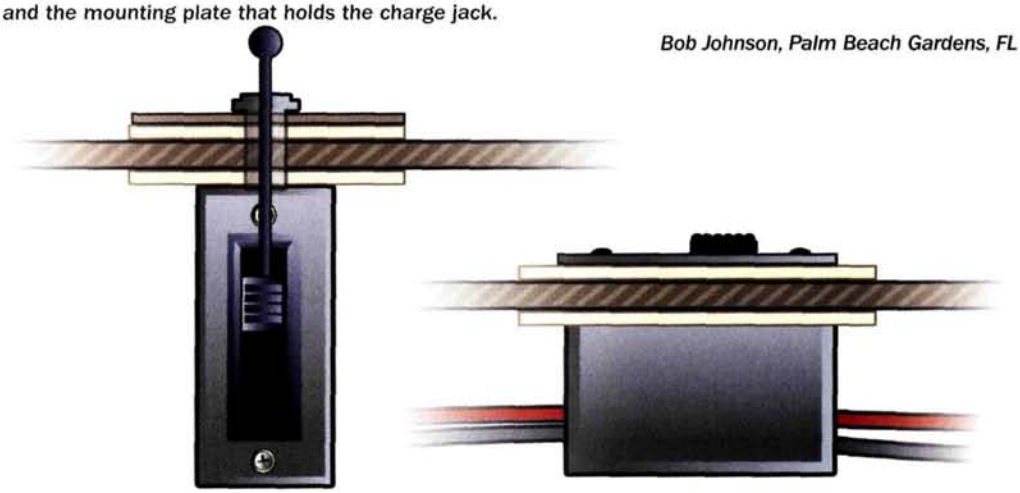
David Erlenbach, Mendota, IL



SWITCH OFF THOSE BAD VIBES

There is no such thing as a "good vibration" when it comes to model airplanes. Vibrations can be particularly troublesome to radio on/off switches, but it is a simple matter to isolate your switch. A couple of pieces of double-sided, servo-mounting foam tape work perfectly. Put one piece between the switch assembly and the inside of the fuselage, and put the other piece between the outside of the fuselage and the mounting plate that holds the charge jack.

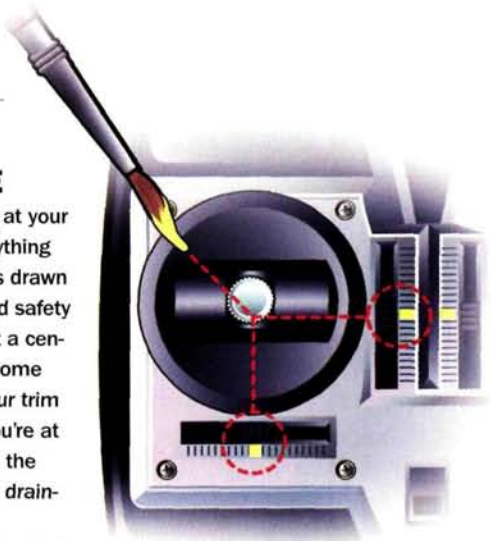
Bob Johnson, Palm Beach Gardens, FL



COMM CLEANER

If you don't have a lathe and need to clean your commutator, try this. Trim the end of a large pencil eraser so that it fits snugly in the brush hood and touches the comm, and then rotate the motor shaft until the comm is shiny again. Be sure to blow off any rubber shavings before you reinstall the brushes.

Matthew Henry
Crescent City, CA



CHECK SETTINGS AT A GLANCE

When you're flying, every second you're not looking at your plane is a second that could lead to a problem. Anything you can do to reduce the time that your attention is drawn away from your model will increase the success and safety of your flights. One simple way to do this is to paint a center mark on your transmitter's trim using white or some other contrasting color. This allows you to check your trim settings any time with just a quick glance. While you're at it, mark the "on" position of your receiver switch on the side of the plane; this will help prevent accidentally draining your battery when you're not flying.

Glenn Bolick, Mechanicsville, VA

PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable, but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

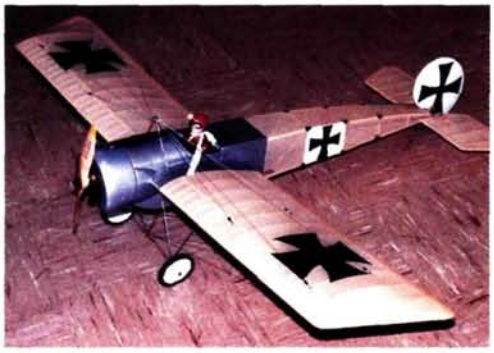
Kitty Earl, Coquille, OR
SCAT CAT 500

Russell Earl is the proud father of 11-year-old Kitty, who built this 3½-pound sport version of the Scat Cat 500. Father and daughter added a functional rudder and enlarged the elevator for sport flying. Kitty powers her Scat Cat with an O.S. LA .40, and she covered it with metallic blue and red MonoKote. On Father's Day, with the help of her dad and using Futaba radios plus a trainer cord, Kitty's first flight went smoothly. She regularly practices flying on her Great Planes *RealFlight* simulator.

Robert Coats, Zebulon, NC
VENTURE 60

This Bruce Tharpe Engineering Venture 60 is the handiwork of Robert Coats. Powered by a Saito .91 4-stroke, the 72-inch-span, 7-pound aircraft is guided by a Futaba radio. The large, lightly loaded Venture performs smooth, graceful aerobatics, and its colorful paint scheme makes it easy to see as it darts around in the sky.

Gordon Brickson, San Diego, CA
FOKKER EINDECKER E-III



Gordon Brickson sent us a photo of this Fokker Eindecker, scratch-built by his friend and fellow Miramar Marine Air Station R/C Club member Frank Gagliardi. Frank's Eindecker is built to 1/12 scale, has a wingspan of 49 inches and comprises many scale details, such as full rigging and a working bungee landing gear. This little beauty is covered with antiqued Coverite and clear dope, and it weighs 3 pounds. For power, Frank chose to go electric, and he uses an Astro 05 geared motor with an 11x8 prop. For guidance, the WW I Eindecker uses three channels.

George Hooker, Rhinelander, WI
KADET SENIOR "CHEROKEE"

Kit-bashing is one of George's favorite pastimes; you can see this from his Kadet Senior. George changed the Kadet from a high-wing to a low-wing Cherokee look-alike with dramatic results. He also moved the stabilizer forward 3 inches, removed most of the dihedral from the wing and added ailerons. The 7½-pound Kadet is powered by a Magnum .65 2-stroke, and the snazzy paint scheme is trimmed with MonoKote. George uses a Futaba radio and says, "This baby flies and looks great!" We think so, too, George!

Ray Smith, Gibraltar, MI
SEAMASTER TWIN

Although Ray has been involved in RC only since 1995, he has made quite a splash in the Monroe Area Cloudbusters with this Seamaster twin that spans 93 inches. Ray scratch-built two Seamaster fuselages and made the necessary modifications to the wing and stabilizer to come up with this unique twin seaplane. It weighs 15 pounds, is covered with MonoKote and is powered by twin SuperTigre 40s. Ray says that the twin flies well; he hopes to add flaps this winter.

Jerry Russell, Bend, OR
DOUGLAS A-26K INVADER

Jerry scratch-built this 1/10-scale Douglas A-26K Invader. He used his own CAD-drawn plans for the 82-inch-span model and outfitted it with retractable landing gear and flaps. The Invader has fiberglass cowls with homemade, dummy radial engines that hide the O.S. .52 Surpass 4-stroke engines. The Invader is finished with Perfect paints, weighs 15 pounds and has 11 servos for flight controls. Jerry is eagerly awaiting its first flight.

Bob Holmes,
Charleston, IL
F-117 STEALTH FIGHTER

Bob sent us this photo of his scratch-built, giant-scale Stealth Fighter. The 25-pound model spans 84 inches, is 108 inches long and has a wing loading of only 16.7 ounces per square foot. Bob built the model of blue foam, lite-ply and balsa, and he covered it with Top Flite EconoKote. For flight missions, a Futaba 8UAF radio and high-torque servos are used on the elevons. Bob says the fighter is somewhat unstable, just like its full-scale counterpart, and he must be on the controls at all times.

Rob Jenkins, Midvale, UT
CARL GOLDBERG JR. FALCON

As a team, Jay Ostler and Rob build many airplanes together, and they recently decided to build this Jr. Falcon that Jay has owned since 1964. To update the controls, they modified the rudder-only model to accommodate a modern 4-channel system with microservos. They also sought to capture a classic look for the model; they covered it with Sig lightweight silk and dope. Powered by a ½A Norvel engine, the Jr. Falcon is fully aerobatic and draws a lot of attention at their club field.

Allen Rice, Boca Raton, FL
PITTS SPECIAL

Allen bought this Pitts Special kit—his first RC plane—way back in 1976 to use as a trainer. Following the advice of local club members, however, Allen changed his mind and put the Pitts kit away. Recently, he decided to finish building it. Covered with MonoKote, the 7-pound, 48-inch-span classic Pitts is powered by an O.S. .91 Surpass. To accommodate the big 4-stroke, Allen had to recess the firewall 1.25 inches. To guide the model, Allen uses a JR 8103 transmitter with a Multiplex IPD receiver. Shown in the photo is Tucker Rice with the building project that only took his grandpa 25 years to complete.

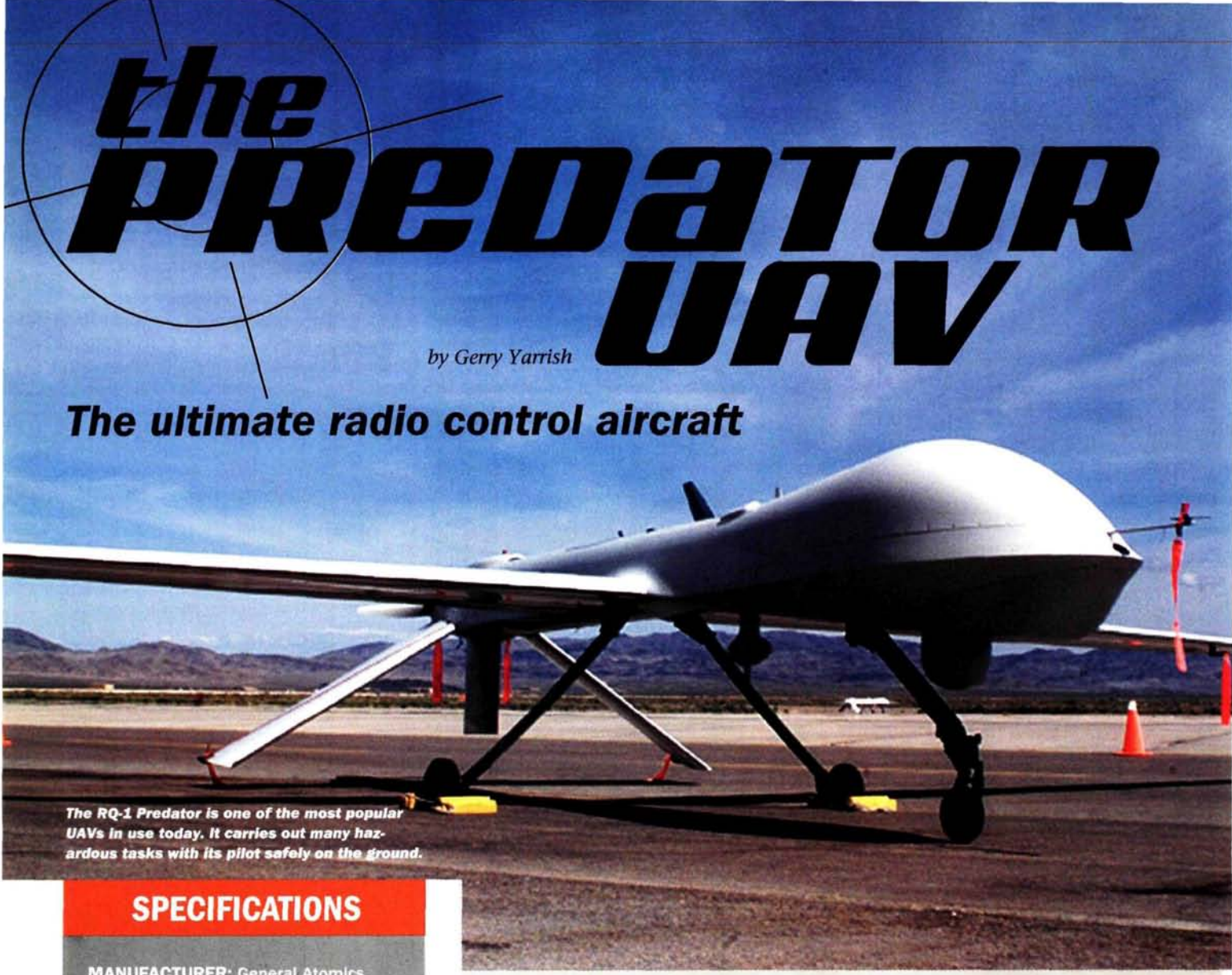
John Scaduto,
Roanoke, VA
SPIRIT OF ST. LOUIS

For his first scratch-built plane, John chose to build this giant-scale Spirit of St. Louis. Completed after 2½ years of on-and-off building, the Spirit has a wingspan of 93 inches and is powered by a Saito .91 Golden Knight. Williams Bros. dummy cylinders painted to match the Saito complete the illusion of a radial engine. To achieve the natural-metal finish up front, John used aluminum tape, Scotch-Brite pads and a Dremel tool to good effect. Other details include tank vents, a cockpit door that opens and closes and a detailed instrument panel. John says his Spirit flies very scale-like, and on take-off, it clears all trees and power lines a bit more safely than Lindbergh's did!

the PREDATOR UAV

by Gerry Yarrish

The ultimate radio control aircraft



The RQ-1 Predator is one of the most popular UAVs in use today. It carries out many hazardous tasks with its pilot safely on the ground.

SPECIFICATIONS

MANUFACTURER: General Atomics Aeronautical Systems Inc.

WINGSPAN: 48.7 ft.

LENGTH: 27 ft.

HEIGHT: 6.9 ft.

WEIGHT: 950 lb. (2,250 lb. max., gross)

POWERPLANTS: 4-cylinder RQ-1A Rotax 912 (81hp) or RQ-1B Rotax 914 4-cylinder, turbo-charged (105hp)

SPEED: 140mph max. (84mph cruise)

CEILING: 25,000 ft.

FUEL CAPACITY: 665 lb. (100 gal.)

PAYLOAD: 450 lb.

COMMENTS: "R" is the Dept. of Defense designation for reconnaissance; "Q" means an unmanned aircraft system. The number "1" refers to its being the first of a series. "A" means that it is the preproduction configuration of the RQ-1A Predator system; a "B" suffix indicates a production configuration.

On February 16, 2001, the RQ-1B Predator became the first UAV to successfully aim and fire a live Hellfire-C laser-guided missile; it struck and destroyed an unmanned stationary target (an Army tank).

PHOTOS BY USAF LT. CARLA PAMPE & GENERAL ATOMICS AERONAUTICAL SYSTEMS INC.

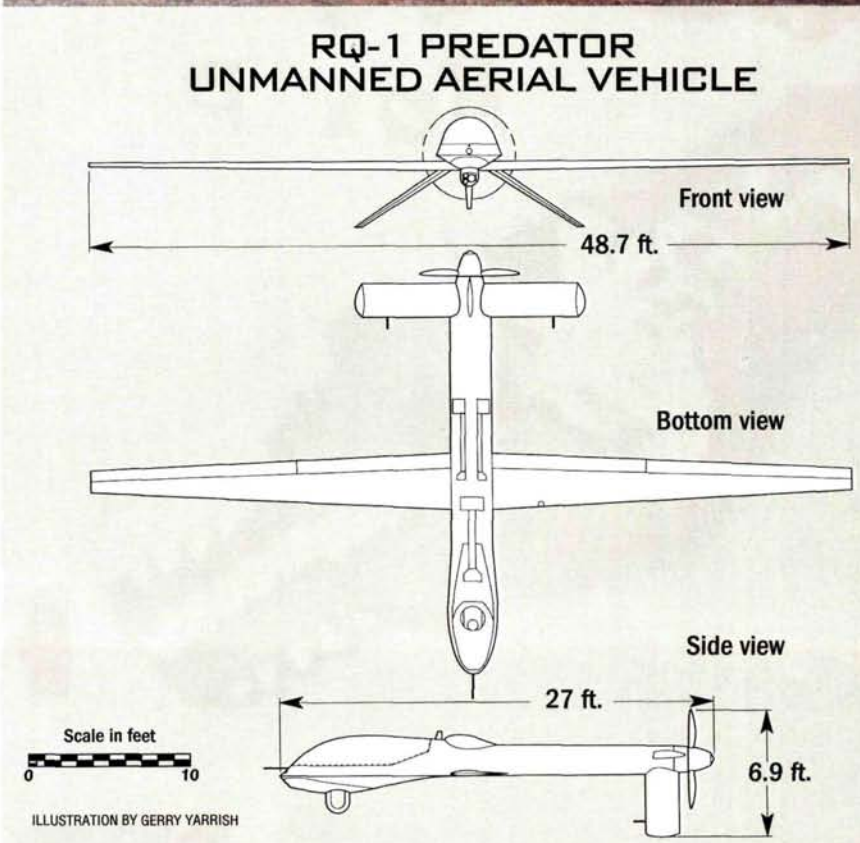


ILLUSTRATION BY GERRY YARRISH

As an RC modeler, I have always been very interested in the U.S. military's use of the remotely piloted aircraft that are more commonly known as Unmanned Aerial Vehicles (UAVs). It is very easy to draw parallels between these futuristic, cockpit-less aircraft and the model airplanes we fly for fun. Whenever I see a UAV on TV, I think how great it would be to pilot one. One of the most popular UAVs is the RQ-1 Predator manufactured by General Atomics Aeronautical Systems in San Diego, CA. Its popularity comes from its media exposure as one of the earliest aircraft deployed over Afghanistan to search for Taliban troops.

Above: this Predator is in for scheduled maintenance. Notice that its large radome has been removed, and you can see the up-link satellite-disc antenna. Left: a Predator undergoes some preflight maintenance.

I wanted to learn more about this unusual aircraft and to talk to the people who pilot and keep the Predator operating. I contacted the U.S. Air Force's Air Combat Command and then talked to the 11th Reconnaissance Squadron (11th RS) at Nellis AFB, NV. I spoke with the Public Affairs Action Officer, Lt. Carla Pampe, and through her, I was able to speak directly to Squadron Cmdr. Lt. Col. Paul Geier. Here's what I learned.

OUR EYE IN THE SKY

The RQ-1 Predator is a medium-altitude, long-endurance UAV used for reconnaissance, surveillance and target-acquisition missions. It is equipped with a color nose camera (used by its "pilot" for flight control), a daytime variable-aperture TV camera, an infrared camera (for low-light/night operations), and a radar system that can look through smoke, clouds and haze.

Above: Airman 1st Class Nathan Eberle, an aerospace apprentice with the 11th Recon Squadron, examines some of the Predator's avionics. Left: the RQ-1B has successfully fired a laser-guided Hellfire-C missile from the air to destroy a stationary ground target.

by Steve Pace

UAVS IN ACTION

During the Vietnam War and then in the Persian Gulf War in 1990 and '91, and later, in Kosovo, relatively primitive and mostly unknown Unmanned Aerial Vehicles (UAVs) were used to gather information and observe enemy positions to provide data that would be analyzed when they were returned to base. Some of today's UAVs, however, can gather and transmit intelligence in real time via computer links to the ground. These include the new generations of unmanned flying machines that can prowl a battleground and give commanders real-time intelligence without risking a human pilot's life.

UNMANNED AERIAL VEHICLES

RQ-2 PIONEER

First used in the Persian Gulf War and later in Kosovo during Operation *Allied Force*, the RQ-2 Pioneer is now believed to be in use in Operation *Enduring Freedom* in the war against terrorism. In Operation *Desert Storm*, RQ-2A Pioneers flew 533 sorties during 1,688 flying hours. So new to battlefield operations were these UAVs that bewildered Iraqi troops actually surrendered to some of those that had landed and/or crashed in the desert after their missions.

The RQ-2 has a high-wing monoplane configuration with twin booms and tail groups and is primarily manufactured of aluminum and fiberglass.

SPECIFICATIONS

MANUFACTURER: Pioneer UAV Inc.
PRIMARY FUNCTION: airborne surveillance, reconnaissance and target acquisition
POWERPLANT: 1, 2-stroke, 2-cylinder 26hp Sachs & Fichel SF2-350 piston engine; small RATO units used for takeoff
WINGSPAN: 16.9 ft.
HEIGHT: 39.6 in.
LENGTH: 14 ft.
SPEED: 115mph max. (92mph cruise)
MAX. TAKEOFF WEIGHT: 450 lb.
RANGE: 110 miles; 5.5 hrs. endurance
TOTAL BUILT: 6, 5-aircraft systems (30)
EST. UNIT COST: $1.5 million

RQ-4 GLOBAL HAWK

The RQ-4 Global Hawk is expected to become operational sometime between 2003 and 2005. Because of its long-endurance mission profile, the aircraft is quite large and heavy. An RQ-4A recently flew autonomously nonstop from South America to Australia—unrefueled. It is a mid-wing design with two outward-canted vertical tails. Its engine air inlet is mounted atop its fuselage. It is mostly manufactured of carbon-fiber-composite material, and as it is relatively large, it might very well be adapted to carry arms.

SPECIFICATIONS

MANUFACTURER: Northrop Grumman
PRIMARY FUNCTION: high-altitude, long-range surveillance, reconnaissance and target acquisition
POWERPLANT: 1, 7,000-plus lb. thrust Rolls-Royce AE3007H turbofan engine
WINGSPAN: 116.2 ft.
HEIGHT: 9.5 ft.
LENGTH: 44.4 ft.
SPEED: 400mph
MAX. TAKEOFF WEIGHT: 25,600 lb.
RANGE: 2,400 nm; 24 hrs. endurance
TOTAL BUILT: 5
EST. UNIT COST: $15 to $20 million

RQ-8 FIRE SCOUT

The Fire Scout is an unmanned Vertical Takeoff and Landing (VTOL) helicopter. Created by Schweizer Aircraft Corp., which produces the airframe, the Fire Scout is then completed at Northrop Grumman.

Northrop Grumman recently received the first and second RQ-8As, known as E-1 and E-2. The E-1 is to begin flight-testing in early 2002. The Fire Scout RQ-8 is an unmanned helicopter made of carbon-fiber composites and aluminum.

SPECIFICATIONS

MANUFACTURER: Schweizer Aircraft Corp.; final assembly by Northrop Grumman
PRIMARY FUNCTION: vertical takeoff and landing UAV or VTUAV
POWERPLANTS: 2 Rolls-Royce 250-C20W turbine engines
HEIGHT: 9.7 ft.
LENGTH: 16.6 ft.
SPEED: 125-plus kn.
MAX. TAKEOFF WEIGHT: 2,550 lb.
RANGE: 110 nm from launch site; 6-plus hrs. endurance
TOTAL BUILT: 1 (for test)
EST. UNIT COST: $8 million

Most of these vehicles fall into the UAV category. Those that carry weapons are known as Unmanned Combat Aerial Vehicles (UCAVs). Combined with recent advances in imaging and Global Positioning System (GPS) navigational equipment, UAVs are used as target spotters, near- and real-time aerial reconnaissance craft and even as weapons systems for combat operations. UAVs and UCAVs are either self-piloted (autonomous) or remotely piloted by someone on the ground and can carry any number of payloads. Combat loads can include GPS satellite-guided bombs, Joint Direct Attack Munitions (JDAM), Air Launched Cruise Missiles (ALCM) and air-to-air and air-to-ground missiles and rockets. Intelligence loads can include electronic surveillance gear and photographic reconnaissance equipment. A number of UAV aircraft, including the RQ-1 Predator, RQ-2 Pioneer and RQ-5 Hunter, are fully operational. Numerous other UAV aircraft have already taken flight in prototype form or are about to do so.

Simply stated, UAVs and UCAVs can do practically anything that manned aircraft can do, but they do it far less expensively and, most important, without endangering pilots' lives.

UNMANNED COMBAT AERIAL VEHICLES

RQ-5 HUNTER

The RQ-5 Hunter won the U.S. Army's 1988 short-endurance UAV competition and first flew in March 1991. Seven, eight-aircraft systems have been delivered. One version of the RQ-5 Hunter, the E-Hunter, can be assembled in the field in about three hours by adding wing extensions.

This high-wing monoplane has twin booms and two vertical tails. It is made from aluminum and fiberglass and has fixed tricycle landing gear.

SPECIFICATIONS

MANUFACTURER: Israel Aircraft Industries/Malat
PRIMARY FUNCTION: short- and medium-endurance surveillance, reconnaissance and target acquisition
POWERPLANTS: 2, 30hp Moto Guzzi engines; launched via two rocket-assisted takeoff (RATO) units
WINGSPAN (R/E VERSIONS): 29.2/54.5 ft.
HEIGHT: 2.2 ft.
LENGTH (R/E VERSIONS): 22.9/24.5 ft.
SPEED: 122mph
MAX. TAKEOFF WEIGHT: 1,600/2,100 lb.
RANGE: 60 miles/10 hrs. endurance
TOTAL BUILT: 75
EST. UNIT COST: $1.5 million

X-45A

The Boeing Airplane Co.—specifically, its Phantom Works—is preparing to flight-test the first of two X-45A UCAV demonstrator aircraft. The X-45A is being developed for the U.S. Air Force, and it will carry 3,000 pounds of ordnance in its two side-by-side weapons bays. Its first envisaged mission is the suppression of enemy air defenses. In other words, it will seek and destroy radar stations and surface-to-air missile (SAM) sites—serving as a "Wild Weasel" aircraft. Its survival will depend on low observability (stealth). The X-45 is tailless and has two sharply sweptback wings. It is made of aluminum, carbon-fiber composite and plastic materials.

SPECIFICATIONS

MANUFACTURER: Boeing Phantom Works
PRIMARY FUNCTION: unmanned combat aerial vehicle
POWERPLANT: 1 AlliedSignal F124 turbofan engine
WINGSPAN: 34 ft.
HEIGHT: 7 ft.
LENGTH: 27 ft.
EST. SPEED: 500mph
MAX. TAKEOFF WEIGHT: classified information; 8,000 lb. empty
RANGE: classified information
ARMAMENT: 3,000 lb.
TOTAL BUILT: 2
EST. UNIT COST: $22 million

X-47A PEGASUS

The Pegasus is being developed for the U.S. Navy for operations aboard aircraft carriers. It is called a UCAV-N (N for Navy). Two X-47A UCAV-N demonstration vehicles have been built for evaluation to see whether it is, indeed, feasible to operate autonomous UCAVs from carriers at sea. Operational UCAV-Ns—like operational USAF UCAVs—would most likely be used at first as Wild Weasel aircraft.

The X-47 is kite-shaped; it has no horizontal or vertical tail surfaces. It is manufactured of aluminum, carbon-fiber composite and plastic materials, and it has retractable tricycle landing gear.

SPECIFICATIONS

MANUFACTURER: Northrop Grumman Integrated Systems Sector
PRIMARY FUNCTION: unmanned combat
POWERPLANT: 1 turbofan engine
WINGSPAN: 27.8 ft.
HEIGHT: 7 ft.
LENGTH: 27.9 ft.
EST. SPEED: 500mph
MAX. TAKEOFF WEIGHT: classified; 7,700 lb. empty
ARMAMENT: 3,000 lb.
TOTAL BUILT: 2
EST. UNIT COST: $22.3 million

Above: With its redesigned tail surfaces, the General Atomics RQ-1B Predator is the latest version of the UAV.
Left: USAF Capt. Sheila Johnson mans a GCS pilot station for a Predator flight.
Below: the Predator's ground-based communication equipment at the Indian Springs auxiliary field.

Manufactured primarily of light, strong carbon-fiber-composite materials, fiberglass and high-strength plastics, the Predator can be quickly disassembled into six main components and loaded into a special shipping container nicknamed "The Coffin" for rapid deployment worldwide. The Predators based at the 11th RS, however, remain fully assembled and are treated and operated as full-size aircraft. Each has its own maintenance crew and crew chief, and they operate out of an auxiliary field called Indian Springs, which is about an hour north of Nellis AFB. Since they aren't permitted to fly in commercial airspace, they take off from Indian Springs and fly directly into the Nevada Test and Training Range owned by Nellis. The 11th RS was the first UAV squadron in the USAF and acquired the Predators in 1996.

GROUND CONTROL

Not just a UAV, the Predator is part of a complete system and is controlled by a ground control system (GCS). Either a C-band (line of sight) or a Ku-band (over the horizon) satellite data link is used to operate a Predator. Inside the GCS is a control console with two operator seats; the left seat is the default pilot station, and the right is for the sensor operator. The pilot uses a joystick, keyboard, rudder pedals and the main display to fly the Predator and to see what the UAV sees. The sensor operator controls the surveillance cameras to acquire mission information. Another GCS control station is set up for a communications and data manager who uploads flight-plan and computer-menu data.

PILOTING THE PREDATOR

Regardless of an individual's rank, the main requirement for becoming a Predator pilot is an Instrument (IFR) flight rating. The IFR rating can be from military or civilian pilot training. The Predator is operated like a full-size aircraft: the pilot must file an IFR flight plan and inspect the aircraft before takeoff. First, the pilot goes to where the UAV is tied down and checks it to make sure it is ready for flight.

Far left: the Predator's all-seeing sensor ball houses a variety of surveillance cameras. Left: what a Predator can see!

says, you pilot the UAV from the outside, just as you would a very sophisticated RC model airplane; then, without really realizing it, you become one with the Predator, and your perception to control inputs makes you feel as if you're flying a full-size aircraft. Only when your shift ends, and the second flight control team takes over, do you make the switch back to being a UAV pilot on the ground.

With a price tag of slightly less than $3 million, these modern spy planes offer a great investment in national security. The bonus of not having to send human pilots into harm's way to acquire important combat information is the icing on the cake. So, the next time you see a UAV on TV, think about the dedicated, well-trained people who fly them and of the 11th Recon Squadron at Nellis AFB, NV—the home of the Predator. ✈

Left: Staff Sgt. Cooley removes one of the pusher prop's protective covers during a pre-flight inspection. Note that the inverted V-tail uses all-flying ruddervator control surfaces.

Then, at the GCS, the pilot inputs flight data, such as the UAV's tail number and its mission weight. The crew chief then starts the engine, the pilot checks the data and control links, and the radios and antennas and all backup systems are checked for proper operation. If everything checks out, the pilot is given clearance to taxi, and he uses the forward-looking nose camera to maneuver the Predator to the runway and take off. The pilot then flies the Predator according to its IRF flight plan to the designated mission coordinates.

Like anything computer-controlled, the Predator's control system might experience a glitch or become locked up. To allow for this possibility, the GCS's pilot and sensor operator control stations can be electronically switched during flight. This allows the pilot to use the other station to fly and control the UAV while the problem at his original station is being repaired. Everything about the Predator has a backup system.

Like today's NASCAR Formula 1 racecars, the Predator's downlink telemetry provides information to the GCS on many onboard systems. From engine rpm, oil pressure and temperature to exhaust manifold temperature, radio operation and how well the UAV is reacting to control inputs, an endless stream of data is fed back to the ground. Each item can be pulled up on a computer screen and the information recorded and analyzed.

The Predator is powered by a 4-cylinder, liquid-cooled Rotax 912 engine. The same engine as is used in many experimental homebuilt aircraft, the Rotax develops 81hp and can propel the UAV up to 104mph (84mph in cruise). Though not extremely fast, the Predator can carry enough aviation-grade fuel for up to a 20-hour flight. It has an empty weight of only 950 pounds, but its gross weight limit is over 2,200 pounds.

A Predator pilot himself, Lt. Geier commented that while flying it from inside the GCS, there comes a point during a sortie when a mental transition occurs. At the beginning of a flight, he

Above: This in-flight picture shows the retracted straight-back-retracting main landing gear to good advantage. Note the de-icing boot on the wing's leading edge. Left: a disassembled Predator in its shipping container.

Designed by Christophe Paysant-Le Roux, winner of the 2000 *Tournament of Champions*, the Kyosho Majestic 1400 ARF is a beautifully made airplane. I was pleased to be given the chance to fly and review a plane designed by a champion, and as I expected, the Majestic turned out to be quite a champion itself. In fact, representatives of the world's leading model publications named the Kyosho Majestic 2001 Model Airplane of the Year, and from what I've seen, it certainly lives up to its title.

Kyosho Majestic 1400 ARF

by Jim Onorato

THE KIT

I'm always a little reluctant to use the word "kit" when it comes to almost-ready-to-fly (ARF) models because, for the most part, they come complete. This is certainly true of the Majestic; it's one of Kyosho's "Super Quality Series" ARFs, and it definitely lives up to its billing. Both the quality and the appearance are superb.

When I opened the box, I was hit by a kaleidoscope of colors. The Majestic is factory-covered and decorated with multiple layers of colored film to create an excellent finish. Its lightweight airframe comes completely built up of balsa and ply.

SPECIFICATIONS

NAME: Majestic 1400 ARF

MANUFACTURER: Kyosho

DISTRIBUTOR: Great Planes Model Distributors Co.

TYPE: ARF aerobat

LENGTH: 52 in.

WINGSPAN: 53 in.

WING AREA: 518 sq. in.

WEIGHT: 5 lb., 8 oz.

WING LOADING: 24.5 oz./sq. ft.

RADIO REQ'D: 4 channel w/5 servos (throttle, rudder, elevator and ailerons)

RADIO USED: Futaba 7-channel w/4 Futaba 3003 servos and 1 Futaba 148 servo for the elevator

ENGINE REQ'D: .30 to .40 2-stroke or .48 to .53 4-stroke

ENGINE USED: O.S. FS-52S 4-stroke

PROP: APC 11x7

FUEL: 10% Red Max 2-stroke

PRICE: $249.99

FEATURES: 90 percent complete; lightweight balsa and lite-ply construction; prepainted fiberglass-reinforced plastic cowl and wheel pants; factory-covered with multiple layers of colored film; complete hardware package.

COMMENTS: Kyosho did a great job on this one. The Majestic goes together easily and flies great. I especially like the striking color scheme; it certainly is an attention-grabber in the air.

HITS

- Excellent flight performance.
- Expertly covered.
- Easy assembly.

MISSES

- Small wheels and wheel pants.

Award-winning pattern plane

The kit includes an engine mount, wheels, a fuel tank, all of the necessary hardware and decals. In other words, the Majestic comes with just about everything you need to get flying except the radio, engine, propeller, spinner and fuel tubing (you may also want to add a pilot figure).

The fuselage is built up. The wing is also built up and the tail feathers are sheet fossil. The cowl and wheel pants are painted, fiberglass-reinforced plastic, and the finish on the cowl is flawless.

Kyosho also includes a 16-page instruction manual to guide you through assembly, thereby eliminating the need for a full-size plan. It includes a lot of symbols and drawings but very few words. It is written in Japanese and English, and all of the dimensions are in millimeters.

ASSEMBLY

Assembly begins with the wing. The ailerons come already installed on the wing panels, but the hinges must be glued with a few drops of instant glue. The hinges are circles, which makes them very easy to install in the slots. They are unique, but be careful; the hinges have slits cut into them to allow better glue penetration, so you must make sure that the slits are perpendicular to the hinge line before gluing.

The next step is to remove the covering

PHOTOS BY WALTER SIDAS

Left: the Majestic comes 90 percent complete with nearly everything you need to get in the air. It's factory-covered with a kaleidoscope of colors to create this brilliant finish. Below: the inclusion of everything you see here really cuts down on assembly time. The fiberglass-reinforced plastic painted cowl perfectly matches the fuselage's color scheme and is deep enough to ensure that only the engine's valve cover and muffler protrude.

from the aileron servo cutouts and the holes for the aileron servo extensions that exit the wing's top side. A die-cut hardwood wing joiner slides into pockets in the wing panels to join the wings. I aligned the panels and glued them together with 30-minute epoxy. I installed two Futaba 3003 standard servos and connected them to the ailerons with the linkage hardware provided. The completed wing has very slight dihedral.

I attached the wheels and wheel pants to the aluminum landing gear and bolted the assembly to the fuselage. Contrary to what you would expect, the slanted edge of the gear goes in front. Though the quality of the wheel pants is very good, both the wheels and the pants seemed a bit small; they are only about 2 inches in diameter.

The instructions call for the engine and the fuel tank to be installed next, but I chose to put that off until later. This turned out to be a good decision because the rudder and elevator pushrods are too long to be installed through the wing saddle. Without the engine and tank in place, I was able to pass the pushrods through the tank opening in the firewall.

I temporarily attached the wing to the fuselage and glued the belly pan into place. Then I glued on the stab and fin with 30-minute epoxy and bolted the tailwheel assembly into place. Once the epoxy had cured, I attached the elevator halves and rudder using the provided hinges.

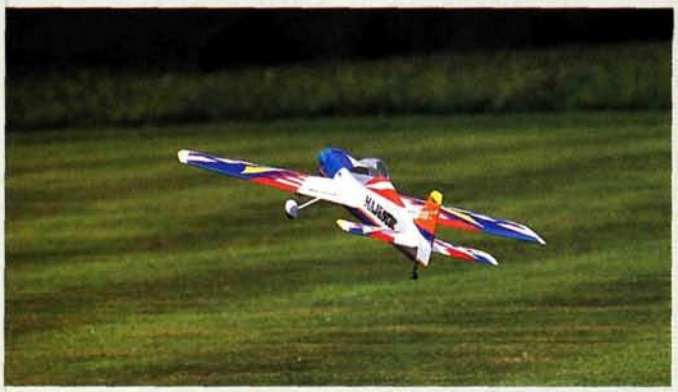
I mounted two Futaba 3003 servos and one Futaba 148 servo (elevator) on the factory-installed servo tray and made up the rudder and elevator pushrods using the dowels and wires provided. The elevator pushrod has two threaded wires at the elevator end (one for each elevator half) and is a little difficult to install. I bent the wires to the approximate angle and then wrapped a rubber band about 1 inch from the end to hold them about ½ inch apart. I then inserted the pushrod through the opening in the firewall and into the fuselage and fed one of the wires through one of the slots at the rear of the fuselage. Next, I placed a brass

FLIGHT PERFORMANCE

Not one to take unnecessary chances with a new airplane, I used the recommended throws for high rate and set the low rate at 75 percent. The initial flight was at low rate.

TAKEOFF AND LANDING

Because of its small wheels and wheel pants, I was a little concerned about how well the Majestic would handle on grass; my concern turned out to be justified. The grass on our field is very thick, and the Majestic had a difficult time getting up enough speed to



make a good takeoff. I finally succeeded by holding the tail, running up the engine and then letting go. The plane had no tendency to nose over, but it did struggle to gain speed. It tracked beautifully without any need for right rudder. When flying speed was attained, I applied just a touch of up-elevator and the Majestic lifted smoothly into the air. I'm certain the Majestic would take off just fine on a hard surface.

The Majestic has a shallow glide slope, which makes landings a real pleasure. I set up a long approach and throttled down to establish the rate of descent while using slight up-elevator to reduce the flying speed. A gentle flare just before touchdown resulted in beautiful 3-point landings. On one flight, one of the wheel pants came loose and rotated 180 degrees, but the Majestic still landed as if on skis and without tipping over.

LOW-SPEED PERFORMANCE

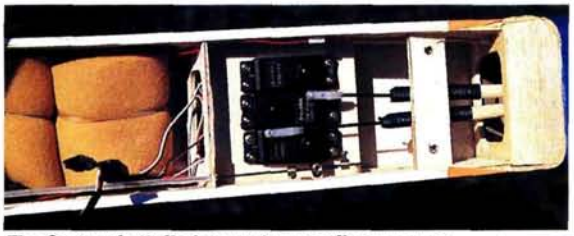
I didn't notice any reduction in control response at low speed. I performed many banking turns close to the ground at low throttle with no problems. The Majestic flew smoothly at low speed and tracked well. This plane does not stall straight ahead. In most cases, when I intentionally put it into a stall, the right wing dropped first, but as soon as I applied power, the plane immediately recovered. It's best to test the stall speed at a safe altitude and adjust your flying accordingly.

HIGH-SPEED PERFORMANCE

Powered by the O.S. FS-52S, the Majestic flew faster than I thought it would. It tracked as if it were on rails. The only problem I experienced was a high-speed tip-stall at full elevator deflection. Otherwise, the Majestic's high-speed flight characteristics can best be described as smooth and predictable.

AEROBATICS

The Majestic does all the things you would expect a good pattern plane to do. After all, it was designed by a world champion, and it certainly flies like one. The plane is very sensitive to aileron and elevator controls, and its response is immediate. The Majestic rolls very fast and perfectly axial. It flies as though it were a much larger airplane. Point rolls are crisp, and sustained knife-edge flight is a breeze. It rolled out at the top of tight loops at full throttle, but reducing the elevator throw eliminated that problem. I particularly liked doing huge, round loops and slow axial rolls. This plane really gets "in the groove" and follows every command. I thoroughly enjoyed flying this one!



The factory-installed servo tray easily accommodates all of the necessary radio gear. When I installed the foam-wrapped receiver and battery just in front of the tray, the CG came out just as the instructions recommend.

tube over the protruding end to prevent it from snapping back into the fuselage. I cut the rubber band and slid the brass tube further onto the first wire. This released the other wire, permitting me to feed it through the slot on the other side of the fuselage. The brass tube held the first wire in line while the second was inserted through its slot. I then removed the brass tube and attached the clevises.

I was then ready to install the engine and the fuel tank. I mounted an O.S. FS-52S 4-stroke engine inverted on the composite engine mount provided. I attached the engine mount to the firewall with four 4x20mm bolts that go into blind nuts. I then assembled and installed the fuel tank and cowl. The cowl matches the film covering on the fuselage very well. It is also deep enough so that only the engine's valve cover and muffler protrude.

With the O.S. FS-52S 4-stroke engine mounted inverted, the muffler sticks out the lower left side of the cowl and points downward. The engine mount is attached to the firewall with 4x20mm bolts and blind nuts.

With the inverted engine, the muffler sticks out through the lower left side of the cowl pointing downward. I used a 2¼-inch Great Planes aluminum spinner.

I wrapped the receiver and battery in foam and installed them in front of the servo tray. The CG came out 4.9 inches behind the leading edge of the wing, which is what the instructions recommend. Last, I attached the canopy with four small screws and applied the decals.

CONCLUSION

I found the Majestic to be a well-made ARF that goes together easily and has a striking appearance when completed. I think Kyosho has done a fine job with the Majestic 1400; it looks great and is a superb flyer. I like everything about it!

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Global Fokker D-VII

Sport-scale WW I fighter ARF

by Bob Van Tassel

Historians agree that the Fokker D-VII was probably the best all-around fighter to come out of WW I. Designed by Reinhold Platz, the D-VII was a clean, simple-looking biplane that was powered by a 160hp radiator-cooled Mercedes engine. The fuselage was constructed of welded-steel tubes covered by fabric. The axle was encased in a third lifting surface between the wheels. It was equipped with two 7.92mm Spandau machine guns. All this added up to a potent package that has become one of the most well-known and well-respected early warbirds. It is also a popular subject for scale models, but until now, most Fokker models came as kits. Recognizing that the popularity of the D-VII isn't limited to kit builders, Global decided to offer an ARF version of this classic. The result, as you can see, is a success. This 48.5-inch-span, .40-size fighter brings the style and grace of the Fokker D-VII to a whole new segment of the modeling world.

THE KIT

Global christened its plane the "Dawn Patrol," and it comes in a colorful box that illustrates many of the model's features. The plane uses all-wood built-up construction and includes a painted fiberglass cowl, a vacuum-formed plastic machine gun, wire wheels and metal center cabane struts. The model comes covered in a colorful iron-on material. Inside, the components are well protected, and my plane arrived in pristine condition. The covering was tight and had no wrinkles even though the kit had been subjected to variations in temperature and humidity.

I enjoy the Global instruction manuals and usually spend some time reading and absorbing the material before I start assembly. The Fokker's manual is exceptionally good; it is well organized and thorough, and its 40 pages contain many extras.

ASSEMBLY

• **Wings.** I started with the wings, as the manual suggests. Installation is simply a matter of epoxying the panels together using the plywood dihedral braces. I used 30-minute epoxy for this step. Position the lower wing in place over the inverted fuselage and check for alignment with the fuselage rear. Align the two dowels in the leading edge with the predrilled holes in the forward fuselage bulkhead, and drill 3/32-inch holes in the trailing edge of the wing. These align with the plywood mounting plate. After everything has been lined up, add a wing-bolt doubler for reinforcement. After you have removed the covering in the appropriate area, mount the horizontal stabilizer on top of the fuselage using 30-minute epoxy. Insert the fin into a slot in the top of the horizontal stabilizer, and epoxy it into position. Precovered, triangular stock reinforces the joint at the horizontal stabilizer and fin. I removed the rudder and elevator temporarily to make the airplane easier to handle during assembly.

The Fokker uses upper strut stabilizer rods that are attached to the fuselage and cabane strut for reinforcement. Set the incidences on the upper wing, lower wing and horizontal stabilizer all at zero. I spray-painted the wing stabilizer rods and cabane struts with black fuelproof paint. Then I mounted the

PHOTOS BY WALTER SIDAS & BOB VAN TASSEL

SPECIFICATIONS

MODEL: Fokker D-VII

MANUFACTURER: Global Hobby Distributors

TYPE: stand-off scale

WINGSPAN: 48.5 in. (top), 43 in. (bottom)

TOTAL WING AREA: 742.75 sq. in.

LENGTH: 43 in.

WEIGHT: 6 lb.

WING LOADING: 18.61 oz./sq. ft.

ENGINE REQ'D: .40 to .46ci 2-stroke or .52ci 4-stroke

ENGINE USED: Magnum XL 52 4-stroke

FUEL: Omega 15%

RADIO REQ'D: 4-channel with 4 servos

RADIO USED: Futaba 6XA

PROP: 11x6 Master Airscrew

STREET PRICE: $229.99

FEATURES: all-wood construction, painted fiberglass cowl, colorful iron-on covering, wire-spoke wheels, metal center cabane struts and a detailed, informative assembly manual.

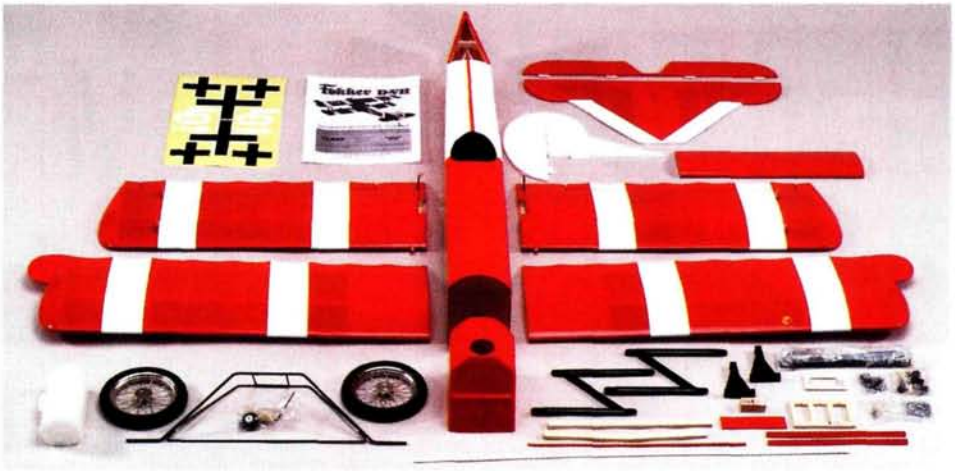
COMMENTS: Global was first out of the gate with a good-looking, easy-to-assemble biplane from the "Great War." They added a lot of detail without making the kit complicated. Excellent flying characteristics make it a good choice all around.

HITS

- Painted fiberglass cowl.
- Wire-spoke wheels.
- Adjustable metal cabane struts.
- Scalloped wing trailing edges.
- Colorful covering.

MISSES

- Vacuum-formed machine gun lacks detail.



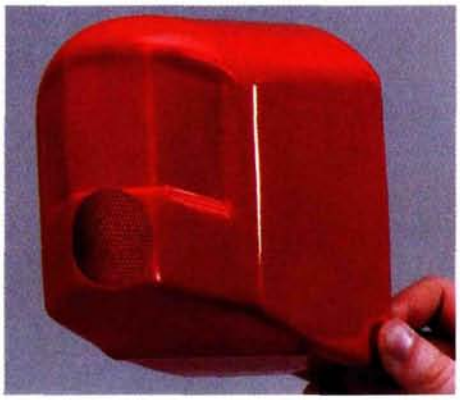
The Global Fokker D-VII ARF comes loaded with features such as metal cabane struts, wire wheels and a vacuum-formed machinegun. It comes 90-percent assembled, so it goes together smoothly in just a few hours with the help of the excellent instruction manual.

outer N-struts onto the lower wing. Attach the top wing to the cabane struts with clamp assemblies and then to the cabane and N-struts. This isn't complicated and is well documented in the manual, but make sure you have the proper incidence.

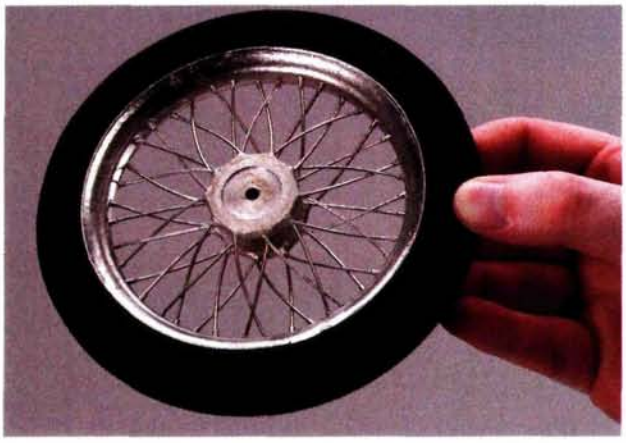
The ailerons, elevator and rudder are all bonded into place using CA hinges and thin CA. Attach the tailwheel bracket to the airplane and the tiller arm of the bracket to the lower side of the rudder.

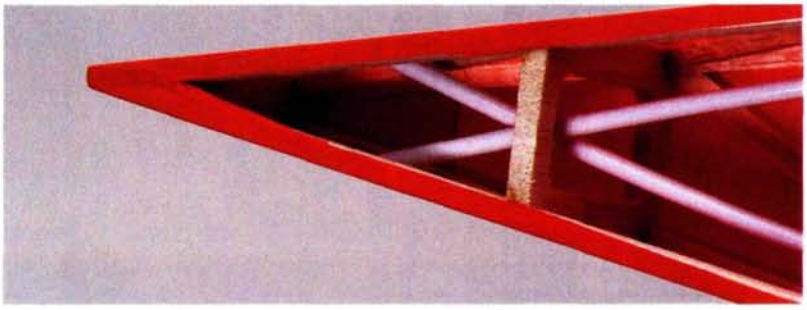
• **Landing-gear assembly.** Install the landing-gear bracket by opening the slots on the underside of the fuselage and inserting the landing gear wire into them. The whole assembly is held in place with four nylon landing-gear straps.

The Fokker D-VII has a third lifting surface, referred to as a "gear wing." This is an airfoil-shaped assembly that fits between the landing-gear struts. To install it, remove the covering from the mounting slot and install the two nylon mounting brackets on either end of the gear wing. Insert the pre-covered piece of square stock into the slot and glue it into place using 5-minute epoxy. Use extreme care in this process, and be sure to set the incidence of the gear wing at zero. A couple of times during assembly, I double-checked to be sure that all incidences were set correctly. The main gear wheels are of wire-spoke material and had been plated. I decided to spray my wheels red and white. I simply masked off the rubber tire and half of the wheel and then sprayed the unmasked half white. Then I masked the white half and sprayed the remainder red. The result went well with the airplane's color scheme.



Left: the painted fiberglass cowl matches the covering nicely and contributes to the plane's scale look.





Left: the classy wire-spoke wheels are large enough to allow the Fokker to handle grass runways with ease. Above: the Fokker uses all-wood built-up construction for a light, strong structure. The pushrod guide tubes are a good example of the level of assembly already completed for you; they make installing your control linkages quick and easy.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

There was a slight breeze (about 5mph) as I pointed the Fokker into the wind and held a bit of right rudder. The takeoff run was about 150 feet on the grass runway. The plane lifted into the air,

all three of the wheels coming off the ground at the same time. I was pleasantly surprised that the plane needed no trimming; it flew perfectly—one of the few that I experienced to do so.

Setting up for landing is done in the usual manner. I kept power on through the entire descent, maintained a good flying speed and landed on the main wheels as opposed to a 3-point landing.

LOW-SPEED PERFORMANCE

At about ⅓ to ½ throttle, the Fokker's flight is very scale-like. I made a number of passes over the field for the photographer at about 100 feet, and it was very stable. The Fokker is not a trainer aircraft; however, anyone who can fly a sport plane should have no trouble with it.

HIGH-SPEED PERFORMANCE

Since it's a WW I airplane, it isn't meant for high-speed performance. Like most bi-wing aircraft of the era, its cabane, N-struts and wings create a lot of drag.

AEROBATICS

Coordination of rudder and aileron proved to be an asset, as the ailerons alone were not very effective at the lower rate. At the higher rate, the D-VII performed basic acrobatics; loops, rolls and Immelmann turns posed no problem. In between, you can cruise around all day at ½ throttle looking for Spads and Nieuports to take on.

For a little extra detail, a Williams Bros. ⅙-scale machine gun was substituted for the molded-plastic gun that came in the kit, and a Hangar 9 ½-scale pilot mans the controls.

• **Engine installation.** The Magnum XL 52 4-stroke engine I used really compliments this airplane. The engine is offset in the fuselage, and I used the supplied motor mounts and followed the excellent instructions. I used a remote glow-plug igniter on the fuselage's right side. With my Dremel tool's cutting disc I opened up the two simulated panels in the front of the cowl. I covered these with nylon screen material and painted them black. The full-size Fokker did not use a spinner, so I didn't use one on the model, but I did use a safety nut on the propeller shaft. I assembled and installed the supplied fuel tank.

• **Radio gear.** Mounting the radio gear was straightforward; there is plenty of room inside the fuselage. The nylon pushrods run to the rear of the airplane through guide tubes and are attached to the rudder and elevator using nylon clevises, control horns and backplates. I mounted the aileron servo on the lower wing and attached it to the aileron torque rods. One servo controls both ailerons.

• **Finishing details.** Mounting the windscreen was simply a matter of gluing it with CA and covering the joint with a piece of red trim tape. I substituted the supplied machine gun with a Williams Bros. ⅙-scale Spandau machine gun. Although the supplied machine gun would have done the trick, it lacked detail, and I wanted to dress this beauty up. I also used a Hangar 9 WW I ½-scale pilot painted with flat acrylic and then sprayed with a clear flat coat of polyurethane. This completed the assembly; now it was time to fly.

The Magnum XL 52 4-stroke is a perfect match for the Fokker. It's reliable and it has enough grunt to produce scale-like flight at ⅓ to ½ throttle.

CONCLUSION

Global has really done a nice job with this classic "Great War" bipe. It is well-built, easy to assemble and has an elegant scale look in the air. As a WW I fighter, it stands out among the ARF segment. Its flight performance is also noteworthy; the biplane flies at scale speeds and performs a variety of aerobatic maneuvers. If you enjoy the convenience of an ARF but want a model with a distinctive style, give Global's Fokker D-VII a try.

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Great Planes Tiger Moth

by Jim Onorato

Originally developed from the D.H. Gipsy Moth, the de Havilland D.H. 82 Tiger Moth was first flown in October of 1931, and it eventually became the basic trainer for Britain's Royal Air Force (RAF). More than 8,700 Tiger Moths were manufactured, 4,200 of which went to the RAF where they were used to train thousands of pilots for World War II service. It continued to serve the postwar RAF until 1951, and more than 250 are still flying today. The Great Planes Tiger Moth ARF is a ⅛-scale replica of the famous trainer, and its construction and flight capabilities faithfully capture the timeless charm of that classic biplane.

PHOTOS BY JIM ONORATO & WALTER SIDAS

ARF

⅕-scale timeless trainer

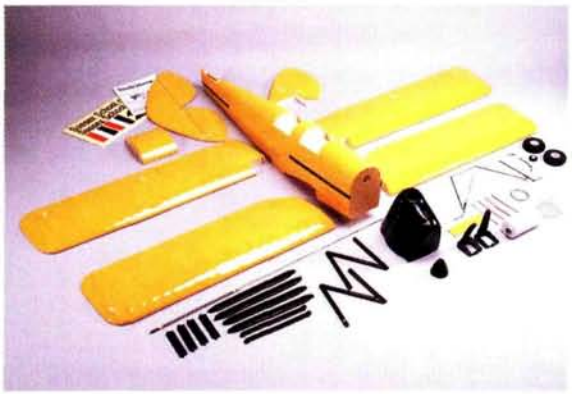
WHAT'S IN THE BOX?

The quality of this kit was obvious as soon as I opened the box. It's constructed entirely of balsa and ply and comes covered with Cub Yellow MonoKote. The kit includes hinges, wheels, preformed and soldered landing gear, an adjustable engine mount, a painted fiberglass cowl, a fuel tank, a spinner, cabane struts, interplane struts, decals, vacuum-formed windscreens and a very generous hardware package complete with all the necessary parts for the flying wires. In other words, it comes with everything you need minus the radio, engine, propeller, fuel tubing and pilot.

The major parts come individually wrapped in cellophane bags, and I was pleased to see that there were very few wrinkles in the covering. A manual full of photos and detailed instructions guides you through the assembly procedure without the need for a plan.

ASSEMBLY

Assembly begins with the wings. Only the bottom wing has ailerons, which I attached with CA hinges cut from a long strip of CA hinge material. After removing the covering over the two aileron servo openings, I installed two Futaba S3001 servos, the control horns and linkage, and then I glued the wing halves together with 30-minute epoxy. Three pieces of ⅛-inch ply make up the wing joiner for a com-



The Great Planes Tiger Moth is nearly a complete package. It comes with everything shown here.

bined thickness of 3/8 inch. A piece of string passes through the wing from the aileron servo to the root. Use this to pull the aileron servo lead through the wing later on. I cut out the exit holes near the root and passed the string up through these holes before joining the wing halves. The bottom wing has 2 3/16-inch of dihedral at each tip.

The next step given in the instructions is to glue the two top wing outer panels to the top wing center section. Do not do this! The dihedral in the top wing is not specified, and if you get it wrong (as I did), the interplane struts won't fit. I used the same dihedral as the bottom wing's, but that was too much. The interplane struts were too short and I had to make new ones. Instead of gluing the top wing together, go ahead and install all the mounting brackets on both wings and attach the bottom wing to the fuselage. Then attach the cabane struts to the fuselage and the center section of the top wing to the cabane struts.

Next, epoxy the top wing joiners into the center section making sure you wipe off all the excess epoxy; then let the epoxy cure. Last, apply 30-minute epoxy to the root rib and joiner pocket of one of the top wing panels, slide it onto the center section, and install the interplane struts before the epoxy cures. This ensures proper alignment of all the parts. Install the other top wing panel in the same way.

The cabane struts are painted black, but the interplane struts are covered with black MonoKote that was badly wrinkled. Since I had to make new struts anyway, I painted the new ones black.

The flying wires included with the Tiger Moth are neither functional nor are they required for structural integrity, but they sure do look great. They take quite a bit of time to assemble, but all the parts are provided, and the final result is well worth the effort.

After removing the covering from the areas to be epoxied, I epoxied the stab and fin into place. Everything lined up nicely without any cutting or shimming. All of the tail feathers are built up to save weight. I attached the elevators and rudder with the CA-type hinges provided and added the tailwheel assembly. I thought the stab support braces were a bit bulky-looking, but they really strengthen the stab.

Great Planes recommends either a .61 2-stroke or a .91 4-stroke engine for the Moth, but there was no doubt in my mind as to which I would use. This plane is ideally suited to the power and performance potential of a 4-stroke engine, so I chose an O.S. FS-91 II Surpass. The kit includes an adjustable engine mount, and the proper thrust angle for the engine is already built in. I attached the engine mount to the firewall with 8-32 socket-head capscrews and blind nuts. I used a Great Planes Dead Center Hole Locater to mark the location of the engine-mounting bolts, then drilled and tapped the mount for 8-32 mounting bolts. I mounted the

The radio gear can all be installed easily, thanks to the roominess of the fuselage and the great, step-by-step instructions. It also helps that the servo tray, elevator and rudder pushrod sleeves come installed.

SPECIFICATIONS

MODEL: de Havilland Tiger Moth

MANUFACTURER: Great Planes Model Mfg. Co.

TYPE: 1/5 sport-scale ARF

WINGSPAN: 71 in.

WING AREA: 1,360 sq. in.

LENGTH: 60 in.

WEIGHT: 9 lb., 4 oz.

WING LOADING: 15.67 oz./sq. ft.

RADIO REQ'D: 4-channel w/5 servos

RADIO USED: Futaba PF-T7 UAF, 7-channel computer radio and a Futaba R128DF, 8-channel receiver w/two Futaba S3001 servos (ailerons), two Futaba S3003 servos (rudder and elevator) and one Futaba S148 servo (throttle)

ENGINE REQ'D: .61 2-stroke or .91 4-stroke

ENGINE USED: O.S. FS-91 II Surpass 4-stroke

PROPELLER USED: 15x6

FUEL USED: 15% Red Max

PRICE: $299.99

FEATURES: 90% built up of balsa and ply and expertly covered with Top Flite MonoKote; comes with nearly everything you need, including hinges, wheels, pre-formed and soldered landing gear, adjustable engine mount, painted fiberglass cowl, fuel tank, spinner, cabane struts, interplane struts, decals, two vacuum-formed windscreens and a very generous hardware package complete with all the necessary parts for the flying wires.

COMMENTS: the Great Planes Tiger Moth is a high-quality, easy-to-build ARF. I thoroughly enjoyed building and flying this sport-scale kit of a classic Golden Age airplane and highly recommend it for both beginners and sport fliers.

HITS

- Great overall appearance.
- High-quality construction and finishing.
- Excellent, step-by-step instruction manual w/photos.
- Scale-like flight performance.

MISSES

- Top-wing dihedral not specified.
- Bulky-looking stab-support braces.

engine inverted and used an O.S. Exhaust Header to allow the muffler to be positioned in the perfect location under the model.

Next, I assembled and installed the fuel tank in the fuselage with the neck inserted into the hole in the firewall. I put foam rubber in front of the tank and held the tank in place with rubber bands attached to hooks that I installed in the fuselage former. I used a two-line fuel system with a Great Planes Easy Fueler mounted on the firewall.

The one-piece cowl is made of light and durable fiberglass, and the detail comes already molded in and painted glossy black to match the cabane and interplane struts. I trimmed the cowl to accommodate the engine then attached it with four 2.5x8mm wood screws. There are cowl-mounting blocks under the covering, so make sure you find them before you drill. When the cowl was in place, I installed a 15x6 wooden prop and the provided 2¼-inch black plastic spinner.

The Tiger Moth's roomy fuselage and excellent, step-by-step instructions make it easy to install the radio gear and pushrods. I used Futaba S3003 servos for the rudder and elevator. The rudder and elevator pushrod sleeves, as well as the servo tray, come already installed. Due to the shape of the fin and rudder, the rudder pushrod and control horn are above the stab. The Tiger Moth uses two pushrods to control the elevators. I joined those at the servo

This plane is well suited to the power and performance potential of a 4-stroke engine. I chose an O.S. FS-91 II Surpass, which I mounted inverted with an O.S. exhaust header, allowing the muffler to be perfectly positioned under the model.

end with two 5/32-inch wheel collars and used thread-lock on the setscrews to prevent them from loosening. I found it more convenient to place the Futaba S148 throttle servo on the left side of the servo tray rather than in the middle, as called for in the instructions. I wrapped the receiver battery in foam and placed it under the fuel tank. I then wrapped the receiver in foam and placed it behind the tank. Last, I mounted the switch, charge jack and a remote plug igniter in the floor of the forward cockpit.

I glued landing-gear fairings onto the preassembled landing gear, attached the gear to the fuselage and added the two provided 3¼-inch main wheels, the 1¼-inch tailwheel and the gear attached to the fuse.

I painted the interior of the cockpit flat black and added cockpit coaming that I made from black rubber fuel line. I trimmed the windscreens with silver striping tape and attached them with R/C-56 canopy glue. Instrument panel decals and a Williams Bros. scale pilot figure completed the work on the cockpit.

Finally, I added the decals and a black MonoKote trim stripe running the length of the fuselage.

CONCLUSION

The Great Planes Tiger Moth is a high-quality, easy-building ARF that looks great on the ground and in the air. With its light wing loading and inherent stability, this is an excellent flying airplane. If you're in the market for a good-looking plane that you can relax with, I think you'll enjoy Great Planes' Tiger Moth. I know I do! ✈

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Williams Bros., *1119 Los Olivos Ave, Unit #3, Los Osos, CA 93402; (805) 534-1307; www.williamsbrosinc.com.*

FLIGHT PERFORMANCE

Initial test flights took place from a grass runway on a sunny, fall day with almost no wind. Following the instructions, I set the control throws to low rate.

TAKEOFF AND LANDING

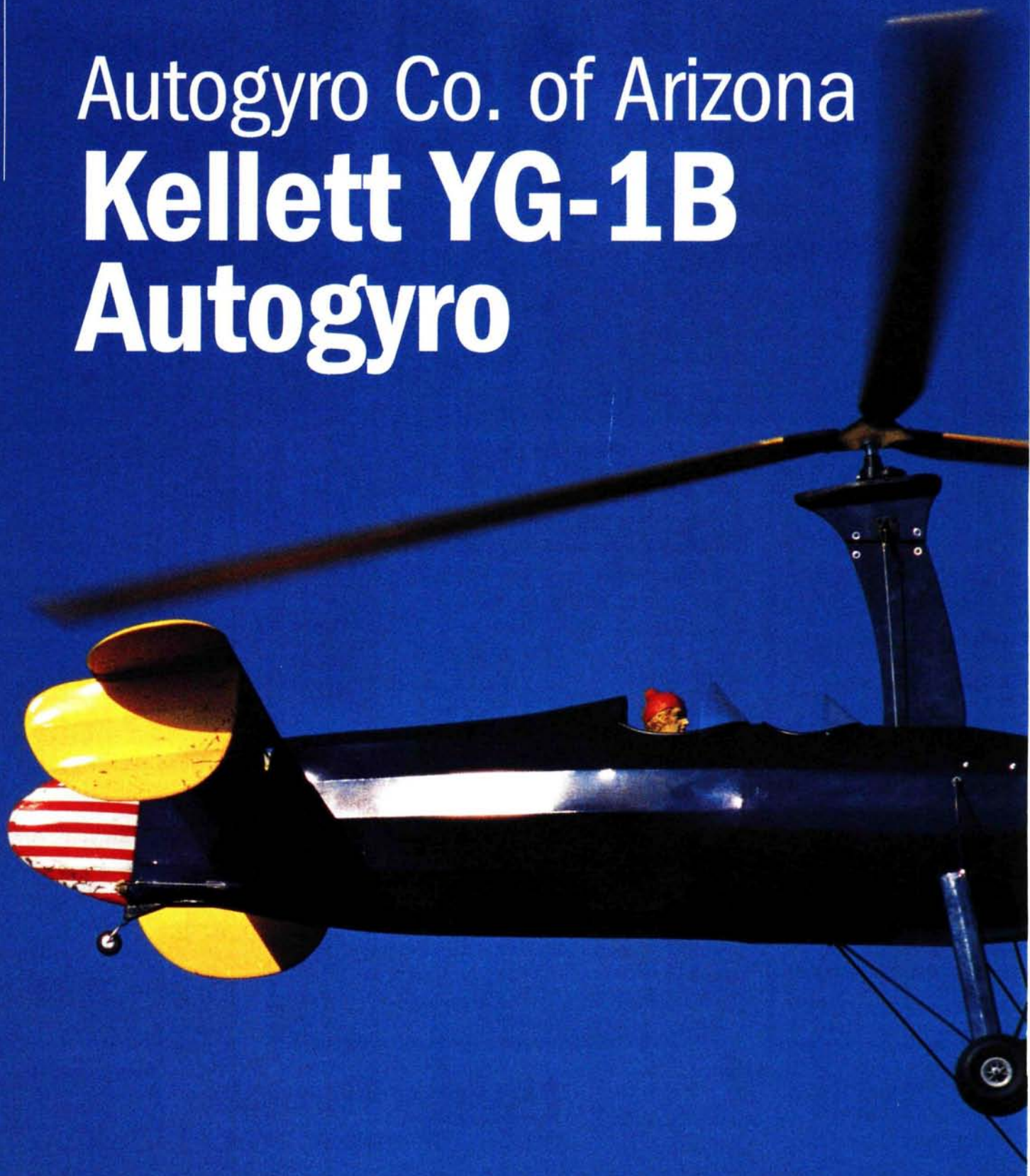
After checking out the controls and gassing up, I fired up the O.S. FS-91 and gently taxied the Tiger Moth out onto the center of the runway. I held in some up-elevator to keep the tail down and gradually fed in more power. As speed increased, I returned the elevator to neutral to let the tail come up, and as I did this, the plane started to lift all by itself. It was a thoroughly scale-like takeoff.

With its incredibly low wing loading, the Tiger Moth is a real floater; it had a steady, shallow glide that made landings effortless. With the engine at idle, I simply applied more and more up-elevator until the plane settled gently on the runway. The landing speed was so slow that I could have walked up to it and grabbed a wingtip.

GENERAL FLIGHT PERFORMANCE

One of the things I like most about the Tiger Moth is its ability to fly at scale-like speed without losing stability. It has a very low stall speed, and its stalls are gentle and always straight ahead. It looks great in the air and is fun to watch as it does lazy horizontal "eights" and other scale-like maneuvers. The Moth spins well, but I had difficulty getting it to roll; it just didn't seem to want to complete the last half of axial rolls. With the O.S. FS-91 at full throttle, the Moth is still no barnburner, and its top speed is not really what you would call fast. The O.S. FS-91, however, does provide ample power and authority to pull it through huge round loops and graceful stall turns.

Autogyro Co. of Arizona Kellett YG-1B Autogyro



by Richard Anderson

The Kellett YG-1B is the latest addition to the Autogyro Co. of Arizona's growing stable of autogyros. This large, sport-scale, rotary-wing aircraft has a rotor span of 74 inches and is IMAA-legal. Like the rest of the company's models, the Kellett is a laser-cut kit and shares a common control system with their other autogyros.

Golden Age wingless wonder

This large model has a rotor disc area of nearly 28 square feet and a loading of 4.5 to 5 ounces per square foot, so you'll need a strong .61 2-stroke or .91 4-stroke engine with a simple 4-channel radio to fly it. A high-torque servo (75-ounce or more) must be used for the rotor tilt control.

IN THE BOX

The kit comes in standard and deluxe versions (the deluxe kit includes hardware). My kit was well packaged; none of the parts were damaged. It comes with two full-size CAD plan sheets and full-size illustrations of all laser-cut wood sheets and other construction details. All of the hardware is neatly bagged and labeled to help you follow the fully illustrated 58-page construction manual. The well-written manual contains many building tips along with chapters for preflight and flight instructions. For construction, I used various glues (CA, epoxy and aliphatic wood glue) where appropriate. Some of the construction, such as installing the servos, elevator bellcrank and firewall blind nuts, needs to be accomplished first; it's difficult to finish them later.

FUSELAGE AND STABILIZER CONSTRUCTION

I began construction by assembling the bottom keel, soaking it in warm water and then using the provided shims to bend it to its correct shape when pinned to the plan. I allowed the keel to completely dry before gluing the formers to it. I positioned the formers and the servo tray on the keel and epoxied them into place using 5-minute epoxy, making sure everything was square. I used the supplied jig to correctly position the firewall to attain the proper downthrust. Being careful not to twist the fuselage, I glued the balsa stringers to the formers with thick CA to form the basic fuselage shape.

The horizontal stabilizer is a full flying stabilizer with a twist: the flat-bottom airfoil on the left stabilizer is upright and upside-down on the right stabilizer. This is a scale replica of the full-size Kellett's horizontal stabilizer arrangement and proved necessary in the model, as well. After I installed the balsa ribs, I sanded them to an airfoil shape and then joined the stabilizer halves to the fuselage with two steel rods that run through a brass sleeve built into the aft end of the fuselage; they are retained with collars and setscrews. After I installed the stabilizer halves, I connected the elevator pushrods to the servo and set the control throws.

The rudder and sub-fins are balsa cores with ribs glued to both sides of the rudder and to the outboard sides of the sub-fins; they are then sanded to an airfoil shape. I next installed the rudder control-horn mounting blocks and the balsa leading edge (LE) on the rudder

PHOTOS BY SHERI SLOAN

SPECIFICATIONS

MODEL: Kellett YG-1B

MANUFACTURER: Autogyro Co. of Arizona

TYPE: sport-scale autogyro

ROTOR DIAMETER: 74 in.

ROTOR AREA: 29.85 sq. ft.

WEIGHT: 8 lb., 7 oz.

ROTOR LOADING: 4.29 to 4.82 oz./sq. ft.

RADIO REQ'D: 4-channel w/3 standard servos and 1 high-torque servo (at least 77 ounces of torque)

RADIO USED: JR X388S; Hitec 7-channel Supreme; 3 Hitec HS-425 and 1 HS-645 servos

ENGINE REQ'D: .61 2-stroke or .91 4-stroke

ENGINE USED: O.S. .91 4-stroke

FUEL USED: Sig 15% nitro

PROP USED: Zinger 16x5

PRICES: $249 (standard kit, without hardware); $299 (deluxe kit, includes hardware)

FEATURES: CAD-engineered plan; laser-cut parts; former and stick construction; large rotor area and light disc loading; large radio compartment; detailed, photo-illustrated instruction manual.

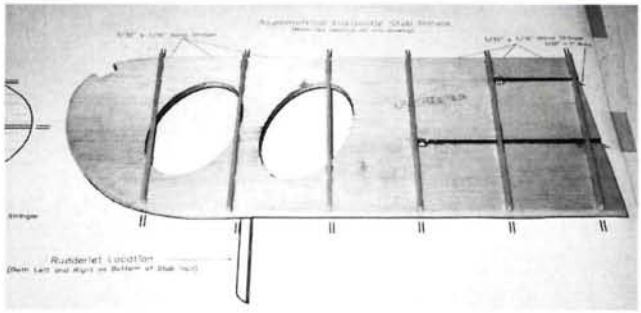
COMMENTS: this large model is fun to fly and easy to see when airborne. With sufficient rotor speed, short-field takeoffs are possible. Short to no-roll-out landings are the norm for this model.

HITS

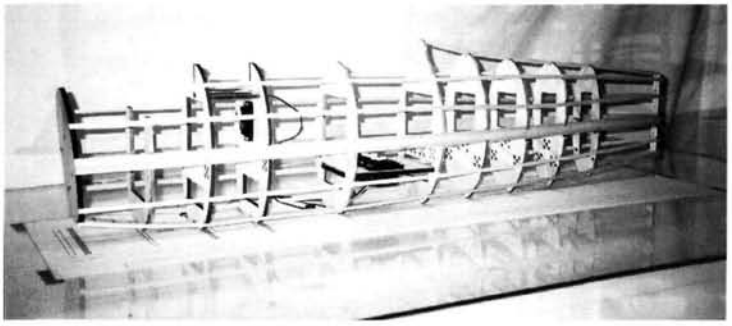
- Easy construction.
- Excellent materials and laser cutting.
- Outstanding flight performance.
- Detailed construction manual and plan sheets.

MISSES

- The turtle deck was difficult to plank.



Left: half of the horizontal stabilizer assembly with the brass tube bearings and collars installed; this arrangement makes the tail components easy to remove for transportation and storage. Below: laser-cut parts make basic fuselage assembly quick and easy.



and fit it to the fuselage; then I connected the rudder pushrod and checked it for proper travel. I next installed the landing-gear-support side plates and lower reinforcement plates and epoxied them into place. I sheeted the forward section of the fuselage with 3/16-inch balsa planks; to properly fit between the stringers, the edges of the planks need to be beveled. To make the planks conform more easily to the shape of the fuselage, I soaked them in ammonia before I glued them into place. The landing gear is rather unorthodox; it looks flimsy but is really very strong and resilient. I placed the fuselage upside-down on my workbench and assembled the landing gear on it. I wrapped the joints with copper wire and used silver solder to tie everything together. The result is a very strong landing gear.

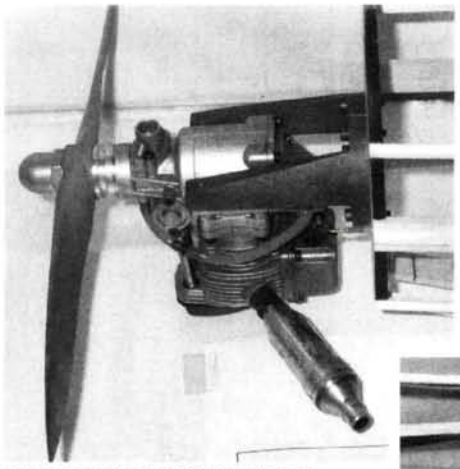
When you install the tailwheel assembly, pay attention to the tilt-back angle of the fuselage; the lower the tail sits to the ground, the easier the rotor system will self-start. I next sheeted the bottom forward section of the fuselage with the precut 1/32-inch plywood sheeting. It's difficult to get the plywood to lay correctly on the compound curves, so I cut it into two parts, and this allowed it to conform to the curvature. I used 5-minute epoxy to glue the sheeting into place. I tried to plank the turtle deck with 3/16x3/32-inch balsa sticks, and I found this difficult to do. I decide to substitute 1/16-inch balsa sheet and sheet the turtle deck in two sections.

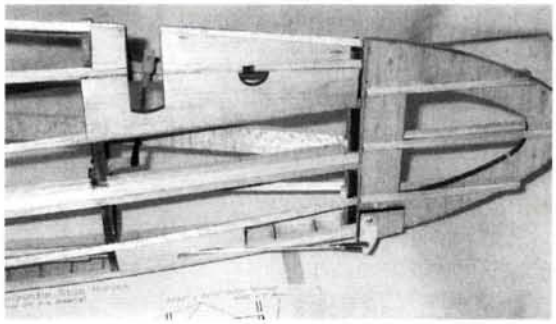
ROTOR PYLON ASSEMBLY

The rotor pylon is built as upper and lower halves that have a polypropylene hinge sandwiched between them to allow the upper pylon to pivot left and right. I used 30-minute epoxy to laminate two 1/8-inch plywood plates together. The polypropylene hinge is held in the pylon with small screws and nuts, in case it ever needs to be replaced.

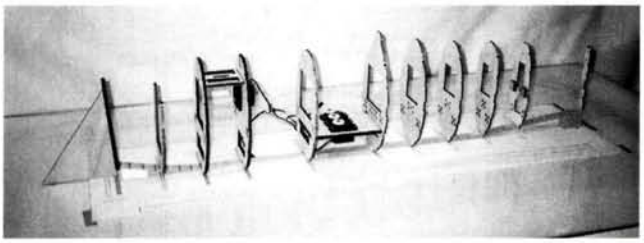
I next installed the upper pylon firewall and the 1/2-inch tri stock and sanded away the excess. Satisfied with the pylon assembly, I trial-fit the rotor pylon assembly to the fuselage; the assembly must fit snugly. It's also important that the rotor pylon fit squarely in the fuselage and be properly aligned fore and aft. Using aliphatic wood glue and tape, I next glued the laser-cut 1/32-inch-plywood front cockpit sheeting to the fuselage. It was a perfect fit.

The Kellett in bare bones, ready to be covered; the minimal airframe is quick to build.





Above: engine installation is very straightforward and simple. Right: the rudder on the Kellett is a single laser-cut balsa core to which balsa sticks are glued and then shaped. The hinge slots are precut in the tail post.



Here are the laser-cut formers and servo tray in place on the keel. Note the jig blocks under the keel.

I installed the fuel-tank hatch-mounting beams and taped the 1/32-inch plywood fuel tank cover into place, and I used servo screws to attach the cover to the fuselage. I glued the firewall nose-ring halves together to form a single piece and then glued it to the firewall. The ring gives the finished model a more scale appearance and really looks nice. I reinstalled the rotor pylon through the slot in the cockpit sheeting, trimming as necessary for proper fit. Next, I installed the upper pylon control horns and pushrods and attached them to the rotor-tilt servo. Make certain that the servo is centered and that you have at least 20 degrees of movement in each direction.

ROTOR BLADES AND HUB

Three rotor blades make up the rotor system. Each blade has a balsa core and is sheeted with 1/32-inch plywood and has 1/32-inch plywood blade grips on the root. The balsa cores have a laser-cut slot on the LE that houses a steel rod that sets the chordwise balance of the blade.

I first laminated the bottom plywood skin to the blade using epoxy. After the epoxy had cured, I used thick CA to glue the steel rod into the LE slot. Using thick CA, I tacked the top plywood skin into place on the LE and then used 30-minute epoxy. I wrapped the top plywood skin around the blade and let it cure. After the glue had cured, I sanded the LE of the blades, installed the balsa LE caps and sanded them to shape. I next installed the plywood blade grips and sanded the blades with 400-grit sandpaper until they were smooth. The manual tells how to balance the blades along with the entire rotor system; the instructions work very well and will result in a well-balanced rotor system.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

As recommended for the initial test flight, I pointed the Kellett into a 10mph wind and gave the rotor a good flip. I set the engine speed to high idle and held in full down-elevator while the rotor system accelerated. As the rotor came up to speed, I began to increase power and accelerate and decrease down-elevator. When the rotor went into full autorotation, the model began to slow, which signals the pilot that the model is nearly ready to fly. I increased power and, as the tail lifted, I held in some up-elevator; the Kellett rose into the air. After gaining some altitude, I reduced power to slow things down and added some right rotor tilt to keep the rotor pylon vertical. I also needed a touch of right rudder trim to keep the Kellett flying in a straight line.

After several minutes of flying, I decided to shoot some practice landing approaches to see how the Kellett behaved at slow speed. I positioned the Kellett into the wind while reducing power just enough so the model began to lose altitude; it settled into a nice, controlled descent. At around 5 feet, I increased the power to smooth out its approach and gain a little more forward motion. After the Kellett had reached the desired touchdown point, I reduced power, and the Kellett began its final descent. At approximately 1 foot above ground, I applied some up-elevator to flare the model, increased power and made a perfect 3-point, no-rollout landing. Even though the model was firmly on the ground, I kept some power on and used down-elevator to prevent the model from blowing back on itself until the rotor had slowed down.

LOW-SPEED PERFORMANCE

The Kellett is capable of extremely slow speeds, and if the nose is raised to a high angle of attack and there is enough wind, the Kellett will actually fly backward.

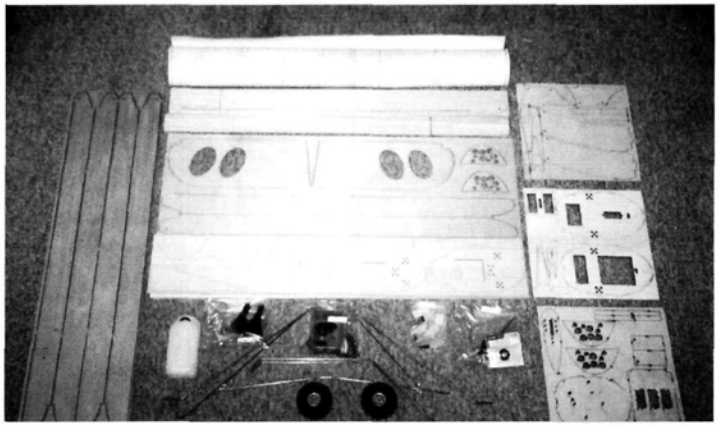
HIGH-SPEED PERFORMANCE

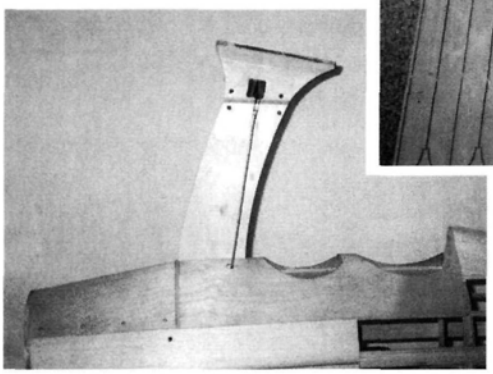
Though the Kellett is capable of high-speed flight, it isn't recommended; there is a real possibility that the advancing rotor blade could actually fold and cause a crash in the process. An autogyro is a graceful type of aircraft and should be flown accordingly.

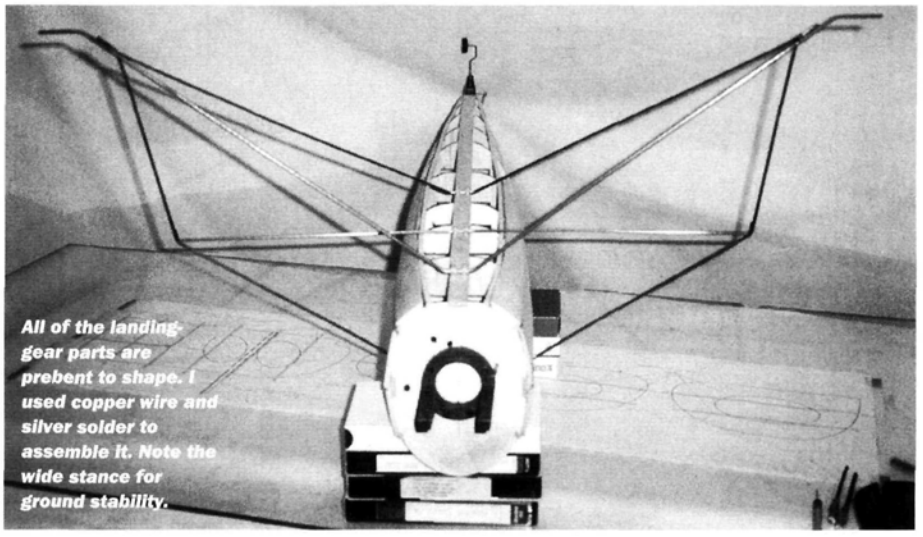
AEROBATICS

The Kellett is capable of performing mild aerobatics such as stall turns or "rotor overs," barrel rolls and loops. Any negative-G maneuver should be avoided, as this will unload the rotor, and rotor rpm will quickly decay. The Kellett is happiest doing what it does best: flying slow and low and doing touch-and-go's and hovering maneuvers.

Right: here are the laser-cut parts and hardware. The cutting was outstanding, and all the wire parts were bent as necessary. Below: the rotor pylon is laminated from ⅛-inch plywood and has a polypropylene hinge sandwiched between the laminates. This allows the rotor to be tilted in flight. I used Du-Bro heavy-duty control horns and a high-torque servo to control the rotor.







All of the landing-gear parts are prebent to shape. I used copper wire and silver solder to assemble it. Note the wide stance for ground stability.

Remember, the rotor blades are the model's most important feature. If you have a bad set of blades, your model absolutely will not leave the ground more than once. Be sure to cover the blades before balancing them.

The rotor hub is very simple. I secured the two triangular hinging plates to the Master Airscrew electric gearbox and screwed this assembly to the pylon firewall. To prevent any of the screws from backing out during flight, I applied 5-minute epoxy to the threads.

To power the Kellett, I used an O.S. .91 4-stroke engine that I mounted inverted. I also installed the 16-ounce fuel tank and connected the throttle pushrod. I had to lower the tank position to accommodate the inverted engine installation.

COVERING AND FINAL ASSEMBLY

With all of the construction completed, I filled any seams where needed and then final-shaped and sanded the model. Since it's difficult to make any adjustments once the model has been covered, I checked the elevator control linkages one last time. To duplicate the classic military color scheme, I used 21st Century's dark blue, yellow, red and white fabric. I also used 21st Century primer and paint for the landing gear. I covered the fuselage in two sections and was able to accomplish the job easily.

I glued the sub-fins to the stabilizer halves and attached the stabilizers to the fuselage with setscrews and thread-lock. After I installed the stabilizers, I noticed there was side play, so I fashioned spacers from some brass tube and added these between the stabilizers and the fuselage.

I reinstalled the engine and mount, fuel tank, landing gear and wheels, and then I hinged the rudder with thin CA and installed the rudder pushrod and hardware. I glued the rotor pylon to the fuselage with 30-minute epoxy and made sure it was properly aligned. When the epoxy had cured, I installed the rotor-tilt pushrods and control arms.

I wrapped a Hitec Supreme 7-channel receiver in foam and mounted it below the front cockpit along with an 1100mAh battery pack.

DETAILS, DETAILS

I decided to add some scale details to dress up the model. The Autogyro Co. of Arizona sells detailing kits for the Kellett; these include Williams Bros. radial engine cylinders, scale pilots and instrument panel gauges. I also added landing-gear fairings and hid the switch harness and charge jack in the front cockpit instrument panel. This is by far the best-looking model in my fleet; it draws a crowd wherever it is shown.

I next checked the CG or "hang angle" by taping the provided profile view to a wall and making sure the profile was level. I then suspended the model by the rotor shaft and checked the hang angle of the model, comparing it with the profile view. There are multiple mounting holes for the rotor system to achieve the proper hang angle. This is a very important step. Remember: a tail-heavy model flies only once!

CONCLUSION

The Autogyro Co. of Arizona has a real winner with the Kellett; it has a striking appearance on the ground and in the air. Easy to build and with an outstanding flight performance, the Kellett autogyro provides a refreshing challenge.

21st Century fabric; *distributed by Great Planes.*
Autogyro Company of Arizona, *3307 W. Renee Dr., Phoenix, AZ 85027; (888) 783-0101; www.autogyro-rc.com.*
Du-Bro Products, *P.O. Box 815, Wauconda, IL 60084; (800) 848-9411; fax (847) 526-1604; www.dubro.com.*
Great Planes Model Distributors Co., *P.O. Box 9021, Champaign, IL 61826-9021; (800) 637-7660; www.greatplanes.com.*
Hitec RCD Inc., *Glenn Merritt, 12115 Paine St., Poway, CA 92064; (858) 748-6948; fax (858) 748-1767; www.hitecrcd.com.*
JR; *distributed by Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (800) 338-4639; fax (217) 355-1552; www.horizonhobby.com.*
Master Airscrew; *distributed by Windsor Propeller Co., P.O. Box 250, Rancho Cordova, CA 95741; (916) 631-8385; fax (916) 631-8386; www.masterairscrew.com.*
O.S.; *distributed by Great Planes.*
Sig Mfg. Co. Inc., *P.O. Box 520, Montezuma, IA 50171-0520; (800) 247-5008; (515) 623-5154; fax (515) 623-3922; www.sigmfg.com.*
Williams Bros., *1119 Los Olivos Ave., Unit #3, Los Osos, CA 93402; (805) 534-1307; fax (805) 534-1366; www.williamsbrosinc.com.*
Zinger; *distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710; (310) 539-2313.*

Multiplex USA Mini Milan

SPECIFICATIONS

MODEL: Mini Milan

MANUFACTURER: Multiplex USA

TYPE: thermal/slope sailplane

AIRFOIL: modified SD 7037

WINGSPAN: 65 in.

WING AREA: 419 sq. in.

WEIGHT: 21 oz.

WING LOADING: 7.2 oz./sq. ft.

LENGTH: 35.8 in.

RADIO REQ'D: 3-channel w/V-tail mixing and 4 microservos (2 for V-tail, 2 for ailerons)

RADIO USED: Futaba 8UAF with an FMA Direct Quantum 6 micro receiver and 4 FMA Direct S80 microservos

BATTERY: 4-cell, 270mAh Ni-Cd

PRICE: $159

FEATURES: sheeted, foam-core wings; lightweight, gelcoated fiberglass fuselage; includes a complete set of decals; comes with nearly everything you need and is easily assembled.

COMMENTS: the Mini Milan is an excellent choice for intermediate and advanced pilots looking for a smaller sailplane with minimal building time and high performance. It comes almost fully assembled with high-quality parts and construction.

HITS
- Beautiful craftsmanship.
- Easy assembly.
- Excellent flight characteristics.

MISSES
- Metric nylon wing bolts.
- Battery recommendation required addition of nose weight.

by Richard Loud

It seems as if the skies above glider fields are often filled with large, complex and expensive sailplanes. To some, these molded marvels represent the epitome of RC soaring, but many sailplane enthusiasts consider their size and price to be a bit too extreme. Enter the Multiplex USA Mini Milan. With a 65-inch wingspan, a price tag under $160 and performance akin to the larger open-class sailplanes, the Mini Milan serves as a bridge between open-bay polyhedral birds and top-of-the-line sailplanes.

THE KIT

The Mini Milan comes with nearly everything you'll need except covering material, hinge tape and adhesives. It has a white, gelcoated fiberglass fuselage and obechi-sheeted foam wings. All of the hardware comes neatly packaged, and the wooden parts are numbered to correspond with the manual's parts list; this is very helpful given the diminutive size of some of the pieces.

CONSTRUCTION

Construction of the Mini Milan is fairly basic. It consists of little more than attach-

Slope-soaring aerobat

PHOTOS BY RICHARD LOUD & DAVE GARWOOD

ing the wing sections, assembling the V-tail and installing the radio.

The first really involved step is to install the pushrod housings inside the fuselage. If you're accustomed to building larger airplanes, this may be a challenge. It's very important not to get glue on the ends of the housings, so be patient and take your time. According to the instructions, you should place a piece of foam in the tail boom to act as a center support for the pushrods, but doing so would eliminate any chance of snaking the antenna out through the tail, so I skipped this step.

The next step is to build the radio tray that will hold the V-tail servos and receiver. The tray slides into the nose through a hole in the wing saddle. I installed an FMA Direct Quantum 6 micro receiver and S80 microservos. It was a tight fit, but it actually turned out to be a nice arrangement. To find the proper placement of the tray, you must temporarily place the battery in the nose of the plane.

Wing construction consists only of assembling the four wing sections. Following the instructions, I used chopped fiberglass as a filler and strengthener at all of the wing joints and at the polyhedral breaks; however, I chose to wrap the center joints with fiberglass tape instead.

It's best to snake the aileron servo wires through the precut passages before you glue the polyhedral joints. This ensures that the wires are in place and prevents glue from blocking the passages.

The center joint requires a little preparation before gluing. You must first install a block for the rear mounting bolt. The instructions then tell you to remove some foam from the leading edge and fill the cavity with thickened epoxy. Later, you will

Left: the Mini Milan comes with obechi-sheeted, foam-core wings, a white, gelcoated fiberglass fuselage and all of the necessary hardware neatly packaged in plastic bags.

Below: here, the FMA Quantum 6 micro receiver and the FMA S80 microservos are installed in the radio-mount tray. This tray slips into the fuselage through a hole in the wing saddle; it's held in place by a single screw.

need to drill and tap the cavity for the forward locating bolt. Because this locating bolt will ultimately have to carry launch and flight loads, I wanted a little more security than epoxy alone would provide. I chose instead to install a plywood mounting block, though I'm sure the factory-recommended method would work fine.

When the wings were complete, I installed the aileron servos. Be sure that the servos are in place before you install the aileron control horns; this will ensure proper alignment.

Construction of the V-tail assembly is easy because the "V" angle is premolded in the fuselage. Simply roughen the finish, line up the parts and glue them into place. Pay careful attention to the location and orientation of the metal control horns; they must fit precisely behind the fuselage. If they are set too wide, the pushrods will bind with the fuselage; if they are too close together, they will bind each other. It's a tight fit, but with a little care, everything will work out fine.

To highlight the kit's elaborate decals, I covered the wings and tail with white MonoKote, but if you prefer, the obechi-sheeted wings can also be painted. I applied the decals using water and detergent per the instructions and attached all of the control surfaces with hinge tape.

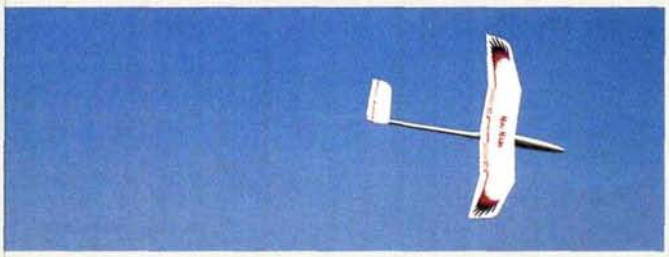
At this point, the Mini Milan is nearly complete. Simply test the equipment and check the balance point. My first check of the center of gravity (CG) showed that I needed to add 3 ounces of nose weight to get it to balance! Since there seems to be enough room in the nose for a larger battery, I recommend installing one; doing so eliminates the need to add extra nose weight.

With the exception of a few minor deviations, I built the Mini Milan following Multiplex's recommendations. I have flown the plane a few times now, and I do have a couple more suggestions. First, if you live in the U.S., throw away the metric nylon wing bolts. If one breaks (as intended on rough

FLIGHT PERFORMANCE

In the air, the Mini Milan really shows its stuff. The impressive, distinctive wing is sure to draw comments from spectators. On the slope, it's equally at home doing high-speed passes, pylon turns and aerobatics, or scrounging for lift on those light wind days. At the thermal field, it launches like a rocket, covers a lot of sky quickly and can turn in the core of a thermal until it's just a speck in the sky.

I conducted initial flights with the control throws set per the instructions. These proved to be perfect for normal and thermal flight, but increased aileron throws are necessary for aerobatics on the slope.



TAKEOFF AND LANDING

I made high-start launches with the towhook set as per the plan. The first thing I noticed was that the Mini Milan tracked straight up the line and climbed like a rocket. You could probably get a steeper launch with the hook moved slightly aft, but it appeared to max out the high start, so I was happy.

On landing, I noticed that the Mini Milan likes its airspeed, and as such, covers quite a bit of ground on final approach. For landing in small fields, I would advise using spoilerons. It's easy to catch a wing on the ground during landing because of the low-profile fuselage and relatively flat wings, so be sure to keep the wings level just before touchdown.

LOW-SPEED PERFORMANCE

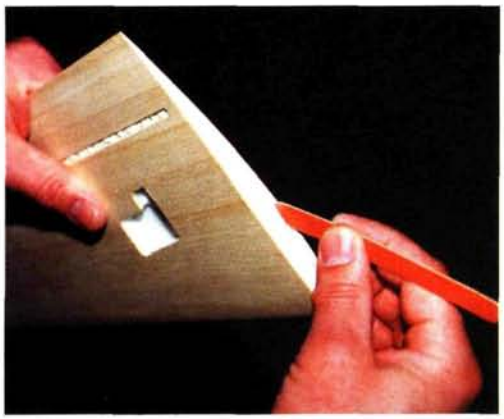
The Mini Milan doesn't like to fly slowly, although it does perform very well in thermals. Aileron authority diminishes at low airspeed, and if you're not careful, the plane will tip-stall; it's best to fly it relatively fast, even in thermals. As with larger sailplanes, thermal turns require rudder-aileron coordination; in fact, the Mini Milan thermals much like its larger counterparts.

HIGH-SPEED PERFORMANCE

The Mini Milan really works best when the air is moving fast over the wings. Tracking is straight and turns are crisp, steep and tight. The Mini Milan showed no bad tendencies at high speeds.

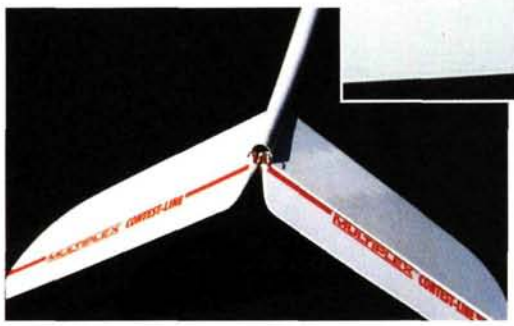
AEROBATICS

The control throws recommended in the instructions are perfect for thermal soaring but aren't adequate for slope aerobatics. With the ailerons cranked up at least twofold, the roll rate can rival other 60-inch-class slope planes, but the Mini Milan is at somewhat of a disadvantage because of its half-span ailerons. With the recommended throws loops are big and lazy, but be careful not to crank them up too much; you may encounter pitch-sensitivity problems. Inverted flight is smooth with no tendency to roll out, and it only requires a little bit of down-elevator.

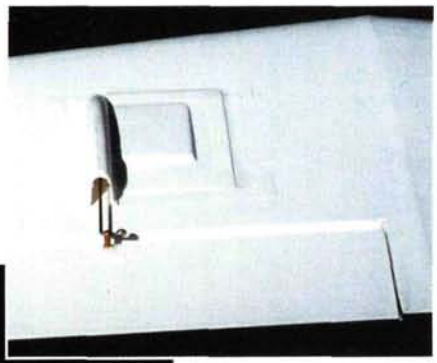


Above: I prepared to join the wing panels by removing a thin layer of foam from underneath the skin. An emery board is perfect for this task.

Right: the V-tail pushrods exit at the end of the fuselage. It's critical to align the control horns; this prevents the pushrods from binding with the walls of the fuselage and each other.



landings), you will have difficulty replacing it. It's better to use nylon bolts that are readily available in the U.S. I also suggest that you reinforce the fuselage at the forward wing-locating slot by adding a plywood backplate or by using a forward wing bolt in addition to the aft bolt. On one landing, the edge of the locating slot broke instead of the locating bolt. The fiberglass in this area is simply not strong enough to carry the loads it will undoubtedly experience.



Above: A close-up of the underside of the wing shows the provided aileron servo cover and the pushrod connection. The control horn is a predrilled brass rod. I secured the pushrod with a drop of solder.

All in all, I found the Multiplex USA Mini Milan to be a pleasure to build and fly. When you open the box, you'll find that almost all the work has been done for you, and the remainder of the assembly is fairly basic, but the best thing about the Mini Milan is its performance in the air. OK, so it isn't one of those big, complex and expensive slope planes, but it sure does fly like one. ✈

FMA Direct, 9607 Dr. Perry Rd., Unit 109, Ijamsville, MD 21754; (800) 343-2934; fax (301) 831-8987; www.fmadirect.com.

Futaba Corp. of America; distributed by Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826-9021; (800) 637-7660; www.futaba-rc.com.

Multiplex USA, 560 Library St., San Fernando, CA 91340; (800) 375-1312; (818) 838-6467; fax (818) 838-3127; www.multiplexrc.com.

Westland Whirlwind

Distinctive British fighter-bomber for twin Speed 400s

by Mark Rittinger

The Westland Whirlwind was the product of the British Air Ministry's requirements for a single-seat, twin-engine, day-and-night fighter-bomber, and it saw service from 1940 to 1943. Powered by two Rolls-Royce Peregrine I Vee piston engines, the aircraft showed much promise. Unfortunately, because of other aircraft production priorities, the Whirlwind was never refined. Sadly, of the two prototypes and 112 production aircraft that were built, none exist today. In 1980, my father won first place at the Toledo Weak Signals RC Exposition with a ½A-powered Whirlwind. He passed away before he got to see it fly; 19 years later, I removed the engines, put two Graupner Speed 400s in it and flew it. The model presented here is a new design and about 1/13 scale. I drew the plan using factory 3-views, and the outlines are very accurate; I did narrow the width of the fuselage and the nacelles to streamline the model.

SPECIFICATIONS

MODEL: Westland Whirlwind

TYPE: electric twin warbird

WINGSPAN: 41¾ in.

WING AREA: 220 sq. in.

WEIGHT: 29 oz.

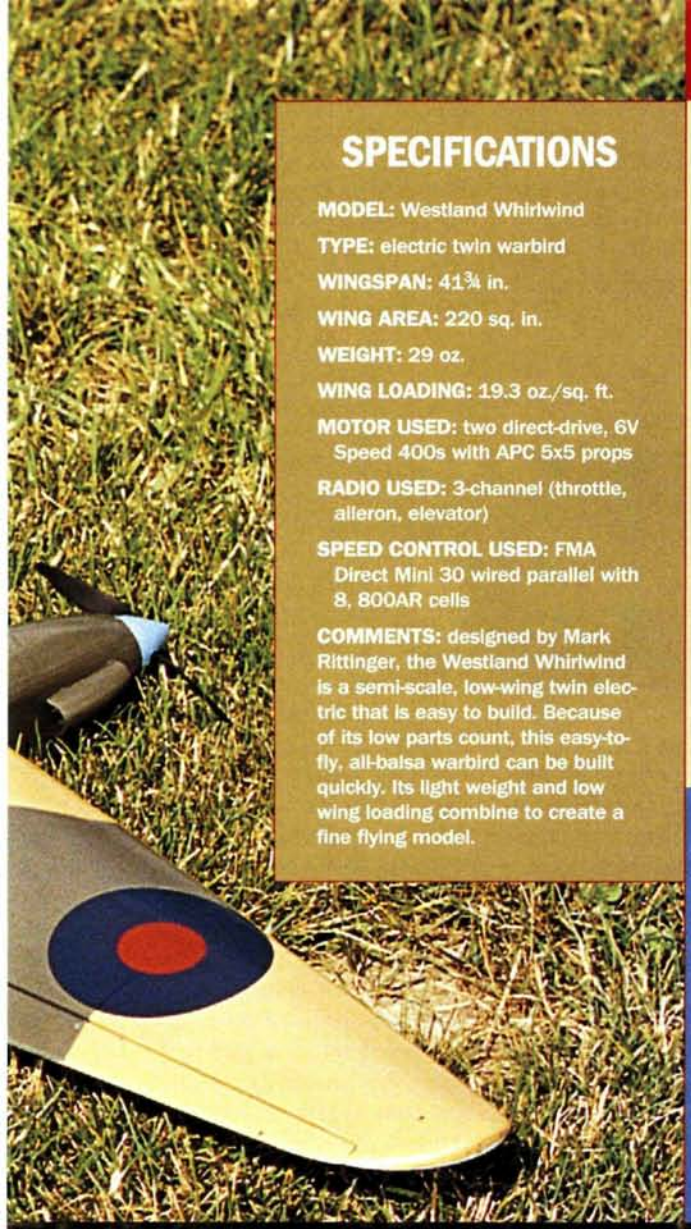
WING LOADING: 19.3 oz./sq. ft.

MOTOR USED: two direct-drive, 6V Speed 400s with APC 5x5 props

RADIO USED: 3-channel (throttle, aileron, elevator)

SPEED CONTROL USED: FMA Direct Mini 30 wired parallel with 8, 800AR cells

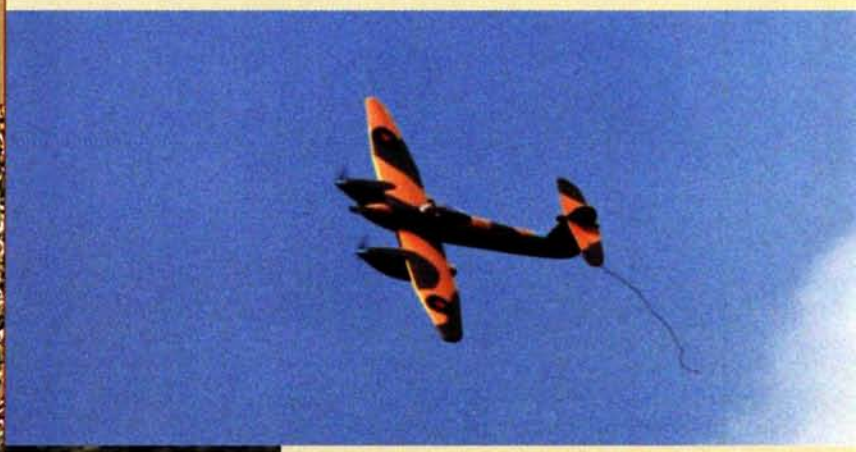
COMMENTS: designed by Mark Rittinger, the Westland Whirlwind is a semi-scale, low-wing twin electric that is easy to build. Because of its low parts count, this easy-to-fly, all-balsa warbird can be built quickly. Its light weight and low wing loading combine to create a fine flying model.



Though not a beginner's project, the Whirlwind can be built and flown by anyone who is comfortable with a low-wing, aileron airplane. As with all electric airplanes, you must choose your wood carefully for the job. When I design an airframe, I want every piece of wood to perform some function. This eliminates excess weight and rewards you with a light, efficient aircraft. So if you're still interested in this unique model, clear off your workbench, and let's start building!

CONSTRUCTION

• **Wing.** Construction goes fast for a twin, as there are only a few parts. Start by cutting the bottom wing skins from 1/16-inch sheeting to the exact outlines. Draw the rib and spar locations on the top side of the bottom wing skin and then glue the ¼-inch medium balsa square stock for the leading edge into place. Make the torque tubes from 3/32-inch music wire and aluminum tube. Cut out all of the ribs from 1/16-inch medium balsa, and glue the center section ribs into place. Do not glue in the ribs at the dihedral break yet; you'll need to add reinforcing fiberglass tape at that location first. These ribs will go in after the dihedral has been set.



Mark poses with his Whirlwind.

Using hard 3/32-inch balsa, cut the two spars/conduits to the length shown on the plan and glue them into place. Cut the holes for the motor wires and glue the tip panel ribs into place. Make the aileron spars of 1/8x¼-inch balsa and glue them into place, then drill a small hole in the aileron faces for the torque rods to fit into.

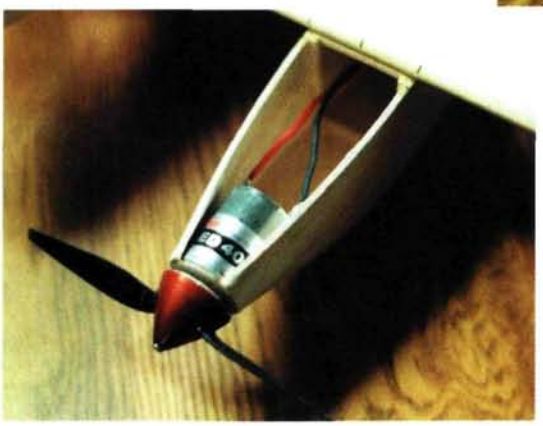
Now add the dihedral. Lightly score the bottom skin where the dihedral break is and elevate each wingtip ¾ inch. When correct, lay the ½-inch-wide fiberglass tape on the joint and glue it with thin CA. Carefully fit and glue in the last center-section ribs. Using a bar-type sander, sand the leading edge to shape, matching the rib airfoil; also lightly sand the tops of the ribs to create a uniform gluing surface.

The next few steps require a bit of care. Cut the center section top skin to fit perfectly to each dihedral break and cut out the area where the aileron servo and torque rods will go. Test-fit the top skin, and when you've attained a perfect fit, use medium CA to glue the skin into place.

PHOTOS BY MARK RITTINGER

Here's the main hatch that provides access to the radio compartment. Only half is sheeted, showing the construction details.

Above: basic assembly of the fuselage with sides joined, awaiting installation of front former, nose block and deck stringer. Below: motor/nacelle assembly glued to the wing. Note how the nacelle sides wrap around the firewall.



The outer panels are a bit trickier to sheet because of the built-in washout. First assemble the washout guide from ⅛-inch balsa, making it ⅛ inch high at the tip and tapering down to zero at the root. Support the center section of the wing, and pin the outer panel to the building board with the washout guide under the trailing edge. Test-fit the top 1/16-inch skin on the panel and, when satisfied with the fit, glue the skin into place. Sheet the opposite panel the same way. When the glue has dried, finish-sand the wing. Mark the aileron locations and cut them out from the finished wing. Sand a bevel on the leading edge of each aileron, and set the wing aside.

• **Fuselage.** The fuselage is pretty much a basic box. Cut the fuselage sides from 1/16-inch balsa sheet, and glue the ⅜-inch-balsa tri-stock into place, along with formers F2 and F4. Now glue the other fuselage side to the formers, and make sure the fuselage is straight. Install F1 and F5 and then pin the tail together. Do not glue the tail together; just glue the fuselage sides to F5. The correct placement of F5 is critical because the fin will butt up to it and provide the correct tail incidence. Add the nose and rear deck stringers and then wet the balsa deck and bend it to the stringers. Mark and cut the deck so both sides meet in the middle of the stringers and glue it into place. Tack-glue the nose block into place and then carve and sand it to shape. Remove the block, hollow it out and then glue it back onto the fuselage.

• **Tail assembly.** Correct alignment is critical here. Build the fin assembly from an ⅛-inch-balsa center core, and cover it with 1/32-inch balsa sheet. It will contain the Sullivan lightweight cable for the elevator. After you've built the fin with the elevator cable installed, make the stabilizer core of 1/16-inch balsa and sheet it with 1/32-inch balsa. Slide the stabilizer into the fin, place the tail assembly into the fuselage and check the fit. The elevator and elevator joiner will be installed later. Now grab the wing, tilt the torque-forward rods to clear the cutout in the fuselage and slide the wing into the fuselage, adjusting the fit as necessary. Check all flying surfaces for correct alignment and incidence, and then glue them into place.

Sheet the bottom of the fuselage and make the rear access hatch. I recommend that you snake your motor wires through the wing now. Build the wing hatch on the fuselage. First, cover the fuselage opening with wax paper, cut the hatch bottom from 1/16-inch sheet and fit it into the fuselage. Add formers F-2B, F-3, the dashboard and the gussets. Now glue the ⅛-inch-square stock on the bottom and the 3/16-inch stringer from former F-2B to the dashboard. Using 1/16-inch sheet, cover the hatch and fit the canopy. You can use a regular WW II canopy or pull one from a mold, as I did.

• **Nacelle.** Nacelle construction is simple. There are no formers! First cut out the four sides and four doublers from balsa and glue them together. Next glue in the ⅛-inch-square verticals and crosspieces, then glue the rear ends of the nacelles together. Attach the motors to the firewalls and tack-glue them to the nacelles. Wet the sides of the nacelles and wrap the sides around the

FLIGHT PERFORMANCE

FLIGHT PERFORMANCE

I always re-check the center of gravity (CG) and the control throws, just in case. Nothing is worse than crashing because you were in a hurry. I have had good luck with APC 5x5 electric props, which I use on the Whirlwind; I think they have the best performance.

TAKEOFF AND LANDING

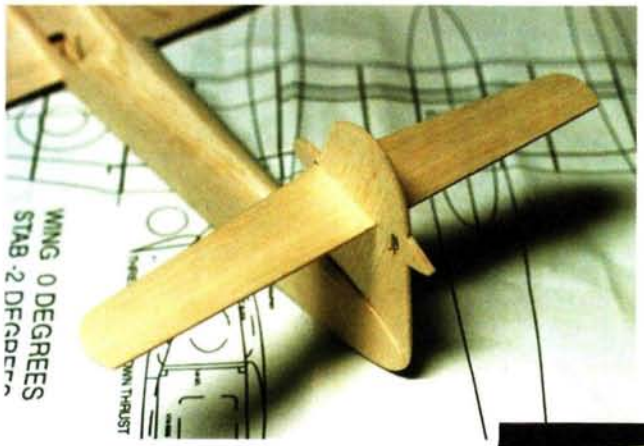
I fed in some up-trim, and flying buddy John Fotiu hand-launched the model slightly nose high with the wings level. A few clicks of left aileron trim was needed for level flight. Landings are easy; just be sure to leave a lot of space, as the model has a pretty flat glide. Its only vice is a tendency to fall off in turns if the airspeed is too low. Keep the speed up until you get the feel of the model in slow turns.

LOW- AND HIGH-SPEED PERFORMANCE

The plane tracks nicely at full throttle and is surprisingly fast. I estimate its speed at around 50mph. If you build the model straight, it shouldn't need down-trim at higher speeds. It grooves nicely, probably because of the large vertical tail area. At low speeds, the Whirlwind will probably surprise you with its handling. It's very stable, and the elevator is very effective. I believe it helps that the stabilizer is up in clean air. A light wing loading always makes for nice, slow landing speeds, and the Whirlwind is no exception.

AEROBATICS

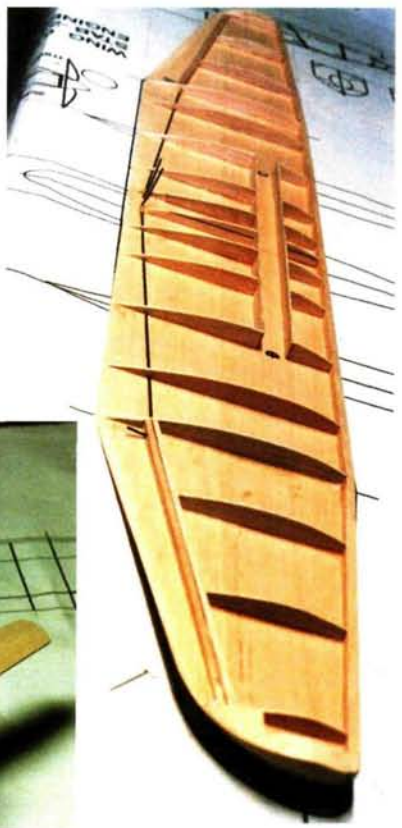
The Whirlwind will do any aerobatics that require elevator and aileron. Rolls are axial for a twin with a flat-bottom airfoil, and loops can made easily from level flight. Inverted flight requires the use of some down-elevator, but it is very solid. A nice maneuver is a split-S, followed by a high-speed pass into a nice roll. Full-throttle flights typically last about 4 minutes; with throttle management, they can last 6½ minutes.

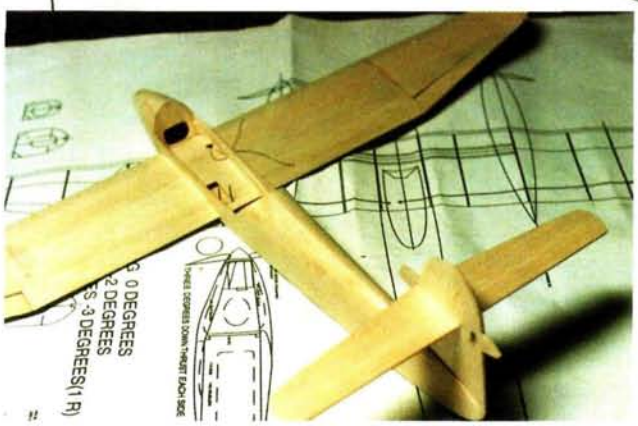


Left: here, the stabilizer is fitted to the fin. The cable for the elevator is built into the fin. The elevators are added after the model has been covered.

Right: the basic wing structure uses few parts for fast building. The torque rods are installed before the sheeting is applied. Note the holes for the motor wiring to the nacelles.

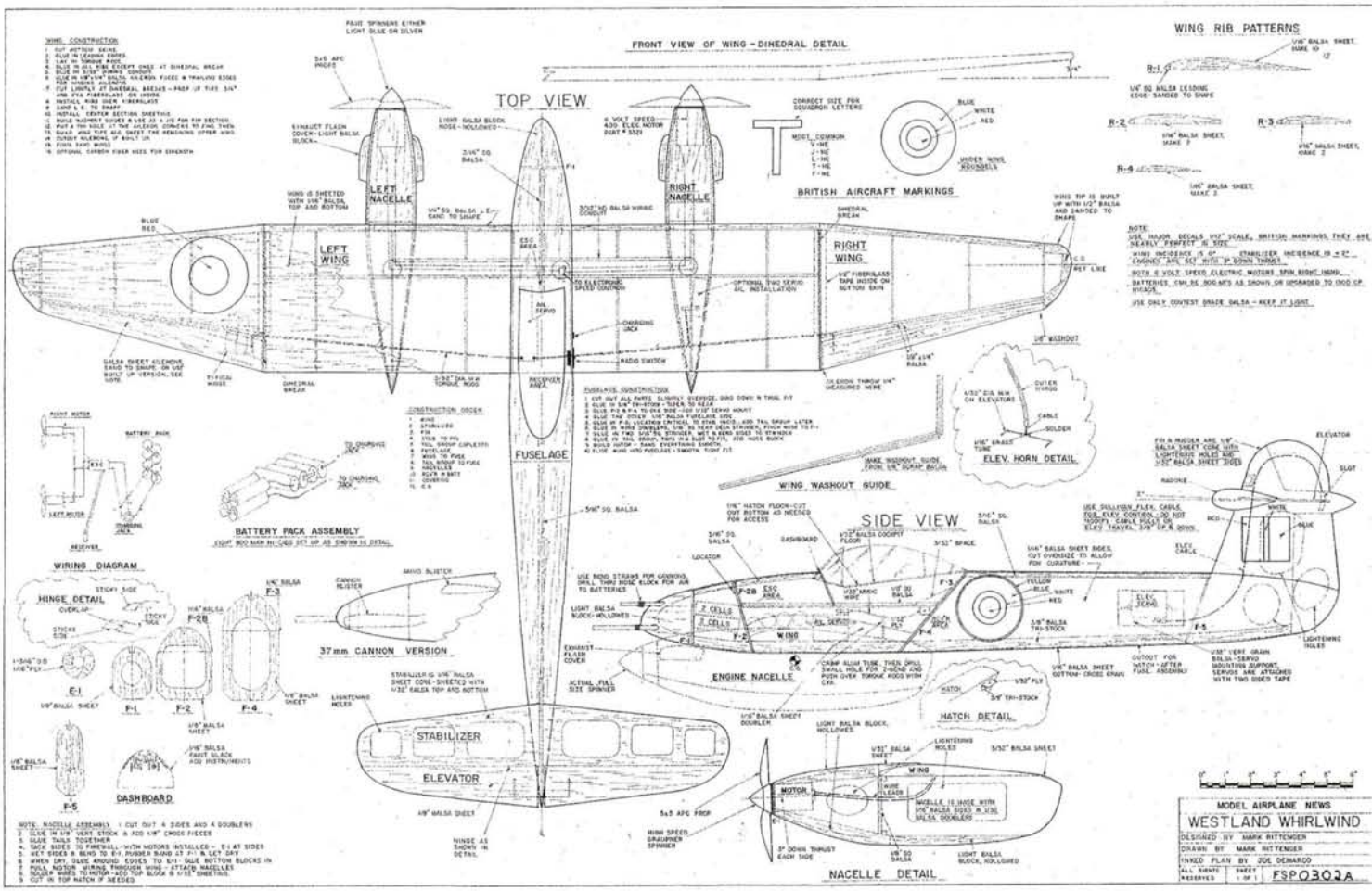
Below: the basic airframe is simple and sturdy. Note how the wing slides into the fuselage. Straight fuselage sides are a must for proper alignment.





firewalls using rubber bands. When the nacelles have dried, glue the firewalls into place and add the bottom blocks. Pull the wiring through the wing and glue the nacelles to it, aligning them carefully. Now add the top blocks, and carve and sand the nacelles to their final shape.

• **Final assembly and radio installation.** Build the elevators from ⅛-inch sheet and construct the elevator horn as shown on the plan. You don't want too much cable coming out of the tube, or you might end up with excessive slop.



To order the full-size plan, turn to "RC Store.com" on page 145.

Radio installation is simple. Note how the aileron servo is offset to the left. For proper balance, I placed the receiver behind the CG.

Radio installation is straightforward. I install my radio gear with 3M double-sided tape; it works great in small planes such as this one. The elevator servo is installed in the rear of the fuselage with double-sided tape. Snake the elevator flex cable through the fin and then attach the elevators to the horn. Make the aileron linkage as shown on the plan and mount the servo with double-sided tape. Because of the short nose, make and install the battery as shown on the plan. Wire the motors, then test them and all the controls for proper operation. To keep the plane light, I covered it with flat olive-drab, tan and gray MonoKote and used ½-scale markings from Major Decals. After I checked its center of gravity, the Whirlwind was ready for flight tests.

The completed Whirlwind, ready to be covered.

SUMMARY

The Whirlwind is a great-flying WW II twin warbird. Its distinctiveness makes it worth the effort. It looks great in the air and is easy to build. What a great companion to the Me 262 A-2a!

If you need help, contact me at mrittinger70@hotmail.com, and I'll be happy to do what I can.

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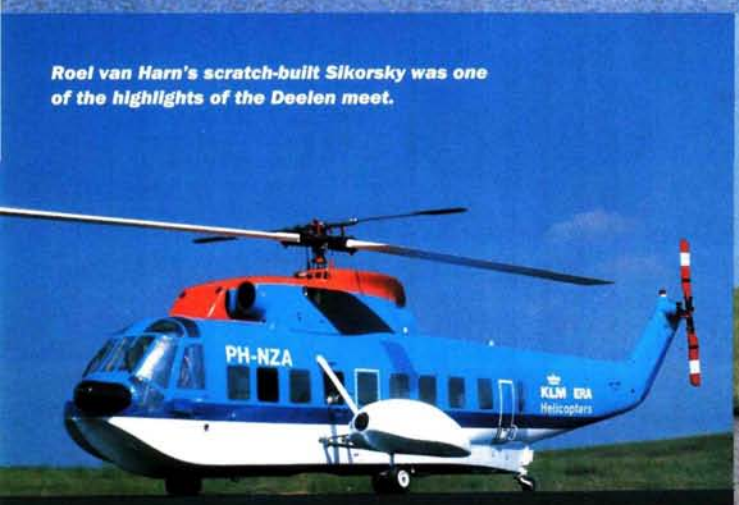
Deelen Scale Meet

Dutch tribute to giant scale

by Dick van Mourik

Deelen Airbase is generally considered to be the best flying site in the Netherlands. Built by the Germans during WW II, Deelen still serves NATO and several Royal Netherlands Air Force chopper squadrons. It's also home to two glider clubs and an active model airplane club.

With an impressive two-mile concrete runway, Deelen is well suited to larger models. In fact, you'd be hard-pressed to find a better setting for the annual Deelen Scale Meet. In addition to the Dutch participants, this meet also routinely attracts many German and Belgian fliers, thanks to its close proximity to the German border.



Roel van Harn's scratch-built Sikorsky was one of the highlights of the Deelen meet.

Here, Ron Ton poses with his Bulldog Racer. Its performance can only be described as impressive.

Paul Scheepmakers brought this well-built Ryan in striking colors.

Paul also brought this fine Harvard. It could easily be mistaken for the full-size aircraft.

Rob Boogaers dressed his Piper Super Cub in an exceptional, rarely seen red color scheme.

Ron Ton also brought along this impressive Grumman Wildcat in British Naval attire. The scratch-built model features a sliding canopy and realistic weathering. Unfortunately, we never got to see it fly.

This Vultee BT-13 belongs to Yke Rusticus, who is noted for designing and building models of lesser-known aircraft.

DEELEN SCALE MEET

Now in its 11th year, this giant-scale meet takes place over the last weekend in August. Organized by the local De Brik flying club, the Deelen Scale Meet is not a competition; rather, it is known as an opportunity for modelers to get together, share their experiences and enjoy flying in a relaxed and friendly atmosphere.

The weather simply could not have been better; temperatures were in the upper 90s with a mild breeze. Though there were fewer entries than in years past, the flightline remained full throughout the two-day event.

Frans van Gaalen built this B-25 from a Nick Ziroli plan. Powered by two Webra 20cc, 2-stroke engines, the model continues to perform flawlessly after four years. Two Perry Pumps keep both engines going at all times.

Approximately 60 giant-scale models participated in this year's event, and each one represented high-quality craftsmanship. An entire spectrum of models was present ranging from the first "wind in the wires"-type all the way up to modern aircraft.

It was also nice to see the high level of skill displayed by all the pilots. Flights were expertly performed with a high regard for safety. In fact, there was only one crash caused by pilot error all weekend. Safety is a big concern in meets such as these; all of the planes had wingspans of at least 80 inches (60 inches for biplanes), and there were no limits on weight or engine capacity. To minimize any risk, no more than three models were allowed to fly at once.

My compliments to the De Brik flying club for planning such a well-organized and successful event. Both participants and organizers can look back on another great year for this annual "Dutch treat." ✈

SCRATCH SIKORSKY

Roel van Harn's Sikorsky S-61N offered a nice diversion from all of the model airplanes at Deelen. Roel originally designed his heli in 1994 to participate in the PH Blue Foundation's celebration of the 75th anniversary of the KLM Royal Dutch Airlines.

Derived from the S-61 military helicopter, Sikorsky produced three commercial models of the full-size S-61: the S-61L, S-61N and the Payloader. They used the same dynamic components as the military version but had longer fuselages. Two sponsons, into which the landing gear retract, distinguish the amphibious S-61N from its brothers. KLM continues to operate two examples of this type of helicopter; they're mainly used to transport personnel and equipment to and from the oil platforms in the North Sea. S-61N helicopters are also used in the U.S., Britain, Norway and Japan.

It took Roel two years to design and build his 22-pound model. A Zenoah engine drives his homemade mechanism. With its striking scheme, a flight demo of this model never fails to impress pilots and spectators.

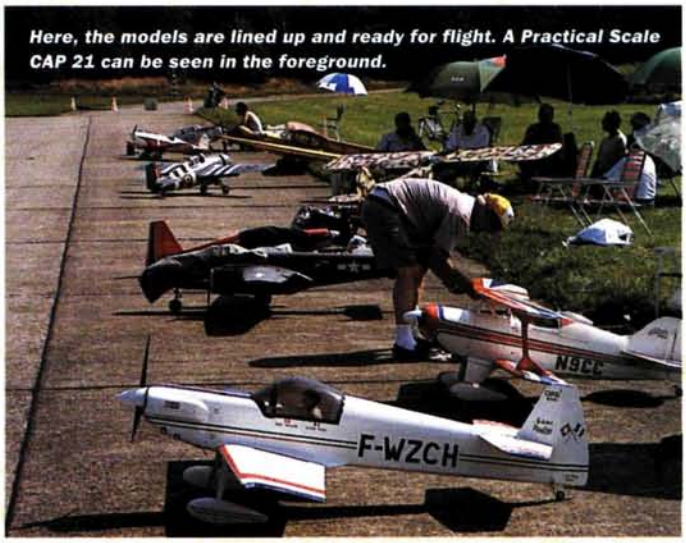
Having designed and built several helicopter models, Roel is considered one of the best heli modelers in the Netherlands. He's currently working on a ⅓-scale Alouette III.

Many extraordinary models graced the flightline at Deelen.

As the day ended, Henk Schoenmakers carried his Tiger Moth back to the car.

Here, Jan van Harn's Tiger Moth leads the flightline. The model is based on a Practical Scale kit.

Theo Boot built this Fokker S-IX from scratch.



Here, the models are lined up and ready for flight. A Practical Scale CAP 21 can be seen in the foreground.

DUTCH AVIATION HISTORY

It's always good to see people take pride in Dutch aviation history, and a fine example of this is Theo Boot's Fokker S-IX trainer. In 1937, the Dutch army commissioned 20 of the full-size aircraft to serve as aerobatic trainers. They were powered by 165hp Genet Major radial engines. Later versions, powered by Menasco Buccaneer in-line engines, were produced in limited numbers for the navy, but Theo favored the bulky appearance of the original when he created his model.

Constructed of balsa and ply, Theo's S-IX has a 110-inch wingspan. It's powered by a 3ci King engine, which pulls the 30-pound model with ease. Theo finished his model with Solartex and then doped it and painted it the standard pale blue commonly used on pre-war trainers.

The S-IX is very stable in flight, but Theo regards the model as somewhat overweight. "Three-pointers are a no-go," he says. "The model absolutely requires that it be flown on the tarmac to prevent it from stalling."

Henk Schoenmakers' Practical Scale Tiger Moth is powered by a Zenoah 38cc engine with gear reduction. The model's cream and maroon color scheme is a pleasant change from the yellow usually found on this plane.

Club chairman Sjoerd Hiemstra has flown this Zenoah .62-powered Extra for many years, and his flying skills definitely reflect his years of experience.

ROMMEL'S STORCH

This ¼-scale Fieseler Storch, designed and built by Richard Sombroek, was certainly one of the most interesting models at Deelen. It's a giant-scale replica of the aircraft used by Gen. Erwin Rommel in his desert campaign. Richard scratch-built the Storch using three views, video footage and cutaway drawings of the full-size aircraft for documentation.

With a 142-inch wingspan and weighing 40 pounds, this aircraft can only be described as impressive. Richard powers his plane with a Zenoah 74cc engine, and an individual servo operates each of the flying surfaces. It's constructed entirely of balsa and ply with a fiberglass cowl. Most amazing of all is that Richard built his plane in only nine months. Retirement, he says, has its advantages.

Chris van Galen's Extra 300 is powered by a SuperTigre G-3250 that provides the ¼-scale model with nearly unlimited vertical performance.

Jan van Harn transports his plane, Dutch-style.

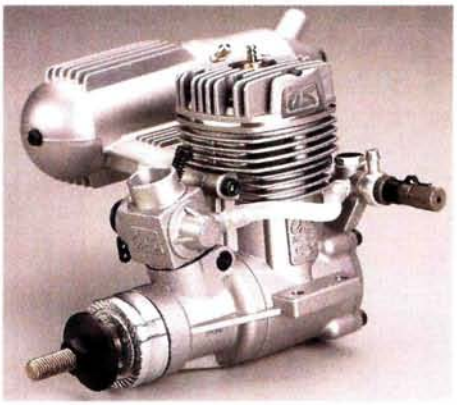
Extend engine life

Helpful tips to keep your powerplant happy!

by the staff of Model Airplane News

Always make engine adjustments from behind the prop.

Today's 2-stroke glow engines are technological marvels; they're powerful, lightweight, easy to use and, with proper use and care, will last for many years. Next to the radio system, the engine is one of the most expensive investments we make in RC. Over the years, we've learned a lot about the care and feeding of engines, and we know there aren't any secrets to operating a model airplane engine correctly. From adjusting the fuel mixture and choosing the best glow plug to proper maintenance and using common sense to improve reliability, this article is full of helpful hints and information to help you have a happy relationship with your 2-stroke glow engine.



The fun we have flying our glow-powered models is directly proportional to how well our engines run. Proper care of and knowledge about how they run are the keys to engine performance success.

EASY STARTING

Nothing is more frustrating than owning an engine that's difficult to start. Our frustration often leads to a flight that ends with a dead-stick landing or a crash. When you start any engine, there are three things to remember. For combustion to occur, your engine needs air, fuel and fire (heat). If your engine won't start, check the carb to make sure that air and fuel are available, and check your glow plug to ensure that it provides enough heat to ignite the air/fuel mixture. Remove the glow plug and attach the glow driver; its element should glow brightly. If it doesn't, replace it; if it does, reinstall it. Close the needle valve and then open it three full turns. Place your thumb over the carb, and flip the prop several times until fuel is drawn through the fuel line and into the carb. If you remove any one of these three elements from the equation, your engine will not start.

SECURE FUEL LINES

Proper fuel-line installation is very important. If your fuel line is too big, it may leak air or even slip off in flight. Fuel lines come in several sizes, so use the size that best fits the carburetor's fuel fittings. Air bubbles in the fuel line may cause the engine to run lean, and if the line slips off, the engine will die. Be sure that there is adequate slack in the line, and secure it to the fuel fitting with a wire clip or a small length of fuel line slipped over the end of the main line.

TIGHT SEALS

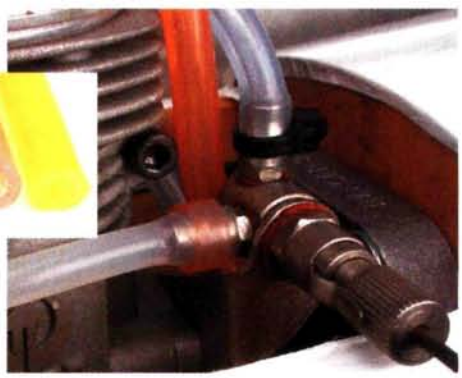
If your engine begins to run erratically, and the mixture leans out even after you've adjusted the needle valve, you may have an air leak in the carb. Make sure that the carb is firmly and properly attached to the crankcase. If the intake is sealed with an O-ring, check it for cracks or breaks and make sure that it's seated properly, lies flat and isn't distorted when the carb-attachment screw is tightened. Make sure that all the adjustment screws and the needle-valve assembly are properly sealed and work correctly.

Last, check that the fuel-intake fitting is tightly screwed into place and that it isn't damaged or cracked. The fuel tank and fuel lines must be properly and securely installed. If you have previously nosed the model over or made a hard landing, the fuel pick-up clunk may have shifted forward in the tank; this can pinch off the fuel supply. The clunk and pick-up line should move freely, and you should be able to hear the clunk rattle in the tank.

Make sure the carburetor is securely fastened to the engine. There is an O-ring at its base and if this is damaged, air may leak into the crankcase and cause the engine to run lean.

FUEL FLOW

If your engine always runs rich or floods easily, check the position of the fuel tank. The tank should be installed in the fuselage so its centerline is at or slightly below the carburetor's spray bar. Use scraps of foam to position it securely so it can't



Above: fuel lines come in several sizes and materials. It's important to match the line to your engine and fuel. Right: make sure the fuel line fits the fuel fittings tightly. Clamp the line, or slip a short length of tubing over the end of the main line to secure it.

A reliable idle is very important, especially during landings. A carburetor can have either a low-end needle-valve adjustment (left) or an air-bleed hole in the front of the carb housing (right). Adjust the high-end needle valve before you adjust the idle.

move around in the tank compartment. If the tank is too high in the fuselage, fuel will tend to be siphoned out and run freely into the carb. Conversely, if the tank is too low or too far away from the carb, the engine may have difficulty drawing fuel into the carb, and it will run lean.

To improve fuel draw, attach a line from the pressure fitting on your muffler to the tank's vent line. If you use a third filler line with your tank close it off to allow the muffler pressure to enhance fuel draw.

IDLE RELIABILITY

An engine that idles poorly can be frustrating. The last thing you want is for your engine to quit during a landing. Proper fuel mixture, too much fuel line between the tank and the engine and the type of fuel and glow plug you use

A tachometer is a very important accessory to ensure proper engine operation. Use one whenever you adjust the engine's air/fuel mixture to check the change in rpm.

WHY USE A TACHOMETER?

A tachometer (tach) is one flightline accessory that I can't do without! I started using one to adjust my engine's needle valve a few years ago, and now I find that using one ensures that my engines run consistently. A tach shows minute changes in engine rpm that you cannot detect by ear. Having the engine set a couple of hundred revs below maximum rpm is ideal. Using a tach to count the prop revs is also much safer than pinching the fuel line to check the mixture setting. Note that the engine should be well broken in; a tight, new engine will rarely hold a good needle-valve setting.

Here are some tips to help you properly adjust your engine.

- Set the high-speed (main) needle valve to the recommended factory setting, and start the engine. The engine should run somewhat rich.
- While using the tach, gradually lean the mixture (turn the needle-valve adjustment screw in, or clockwise) until there is no longer an increase in rpm. Adjust the mixture slowly, and allow the engine speed to stabilize.
- Once you've achieved peak rpm, richen the mixture slightly (again, using the tach) to reduce the rpm by 200 to 300.

Once you've set the high end, check the idle setting. After you have properly adjusted the engine, avoid the temptation to tweak the needle valve whenever you restart your engine. If atmospheric conditions (humidity, air temperature, etc.) change, however, then a click or two of the needle valve may be necessary. Again, use the tach to check rpm while making these adjustments. —*Rick Bell*

Exploded view: engine parts description.

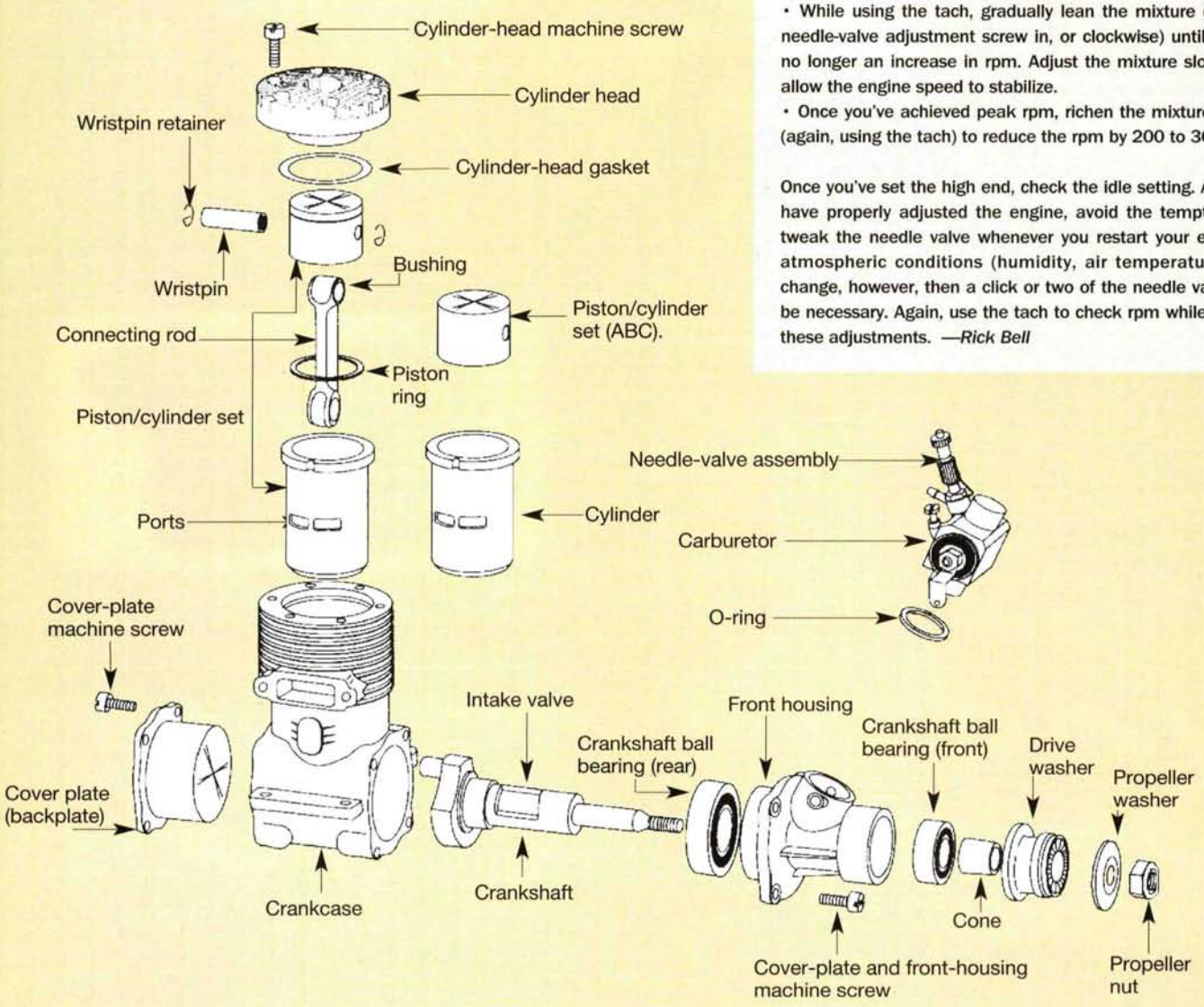


ILLUSTRATION BY CHRISTOPHER MENDOLA

can all affect an engine's ability to idle reliably. The most common problem is a too-rich mixture. Adjust the high-speed needle for a slightly rich mixture and then adjust the idle. Start the engine and adjust the throttle for an idle of 2,100 to 3,000rpm. After several seconds, advance the throttle to full open. If the engine sputters and spits raw fuel out of the carb, the idle mixture is too rich. Stop the engine, and turn the idle adjustment clockwise (in) about ¼ turn to lean the mixture. Repeat this procedure until the engine transitions smoothly from low to high speed. If you have an air-bleed carburetor with a small hole at the front of the carb body and an adjustment screw control idle, turn the idle screw in to richen the mixture.

A GOOD MIX

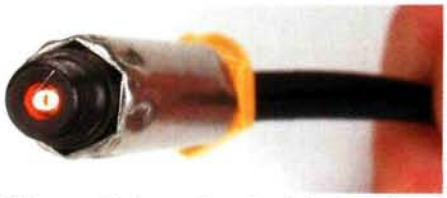
When you hear someone talking about adjusting an engine, you'll often hear them refer to "the mixture." This is the mixture of air and fuel that is combined in the carburetor. Fuel and air enter the venturi, become atomized and enter the engine through the intake port. The atomized mixture then enters the crankcase and is transferred to the combustion chamber through the bypass ports. The needle-valve assembly brings the air and fuel together and controls the ratio between the two. If there is more air in the mixture than the engine needs, the mixture is "lean." If the mixture has more fuel than is required, it is "rich."

Of the two, a too-rich mixture is preferred, as little (if any) damage will result from running your engine on the rich side. Running your engine too lean, however, will overheat it and, if you do it too frequently, you'll damage the engine.

HAPPY GLOW PLUGS

The glow plug is a critical part of the engine's overall performance; you can choose from several types, but always refer to your engine's instructions for the recommended plug. Glow plugs come with long and short thread parts, with or without an idle bar and are rated for hot or cold operating temperatures, but they don't last forever. The first sign that a plug is on its way out is a drop in rpm when you remove the glow-plug driver; also, when an engine that normally idles well suddenly doesn't run well at low rpm, you have a problem. If you use a plug that is too hot for your engine, the engine may suffer from detonation and pre-ignition and might overheat and run lean. Using a plug that is too cold will result in lower top-end rpm and poor idling. Small engines (.15 and smaller) should use short-reach plugs; a plug that's too long may hit the top of the piston and damage the engine.

Glow plugs come in several sizes and types; here, you see (left to right) a short-reach plug, a standard (or long-reach plug) and a standard plug with an idle bar. Use the type of plug recommended by your engine's manufacturer.



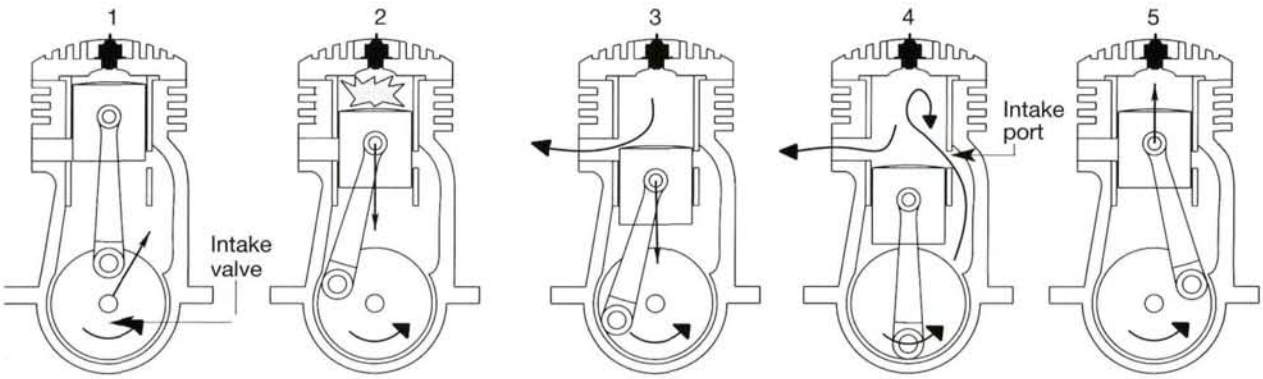
Make sure that your glow plug is in good shape before you use it. It should glow brightly when energized by the glow driver.

STAYING COOL

A cool engine is a happy engine. One of the worst things you can do to an engine is to run it lean. This increases its temperature and can drastically shorten its life. Always use a tachometer to adjust peak rpm and then richen the mixture slightly for a 200 to 300rpm drop from the peak

TWO-STROKE ENGINE OPERATION

A 2-stroke engine is relatively simple in operation. The crankshaft makes one complete revolution for every power cycle. During the piston's upstroke, the fuel/air mixture above the piston is compressed for combustion. At the same time, a fresh mixture is drawn into the crankcase below the piston. After combustion, the piston is forced downward, and the spent fuel charge is expelled through the exhaust port. At the same time, a fresh fuel/air mixture is drawn through the carb and into the crankcase. The intake valve is sealed, and the mixture is forced through the transfer ports and into the cylinder above the piston to start a new power cycle.



1. As the piston reaches top dead center (TDC), a fresh air/fuel mixture charge is drawn into the crankcase because of the low pressure created as the piston travels upward.
2. The piston then compresses the mixture in the combustion chamber, and it is heated and ignited by the glow plug; this forces the piston down.
3. As the piston comes down, it opens the exhaust port, and the spent fuel begins to exit the combustion chamber. At the same time, the piston compresses the new fuel/air mixture in the crankcase.
4. At bottom dead center (BDC), the piston opens the bypass port, and the new air/fuel mixture charge flows from the crankcase into the combustion chamber as the last of the spent charge leaves.
5. The piston comes back up and seals the exhaust and bypass ports, and the entire process begins again.

reading. If your engine is inside a cowl (such as in a scale model), make sure you provide adequate ventilation. Ideally, the air-exit area should be at least twice the size of the air-entry area. Don't block the air outlet with the engine's muffler, or you'll greatly increase the engine's operating temperature.

PROPER COMPRESSION

Compression is important to a glow engine. As well as affecting the density of the fuel mixture, compression is also necessary for the glow plug to fire. If your engine becomes difficult (or impossible) to start, compression may be low. To fix this, check the glow-plug and engine-head bolts to make sure they are tightly fastened. You should also check the backplate attachment bolts. If the cylinder-head bolts are loose, air can leak into the combustion chamber, and this will affect performance. If you have been running your engine too lean, the piston and sleeve fit can be worn out, and this will prevent your having a tight seal. If this is the case, you'll have to replace the worn components.

KEEP YOUR ENGINE CLEAN

If you fly off grass, there's always a chance that your airplane will nose over or overshoot the runway on landing. The odds are pretty good that debris will get onto and inside your engine. Always clean your engine after a mishap, and never turn the prop shaft until you're sure the engine's inside is clean. If they aren't removed, dirt and grit can impede engine cooling; even worse, ingested debris can ruin the interior of the engine. Clean the engine by plugging the muffler's outlet and the carburetor's venturi with small wads of paper towel. Stand the plane on its nose, and spray a mixture of dishwashing liquid and water onto the engine. Scrub the engine with a toothbrush, and use a toothpick to remove debris from between the cooling fins. Wipe the engine clean and let dry.

ENGINE CORROSION

Corrosion is the main enemy of our engines. It forms on the bearings and other ferrous components. The alcohol contained in glow fuel is hygroscopic (it attracts moisture). To prevent corrosion, at the end of the flying day, always run your engine until it is dry of fuel and use after-run oil. When you've finished flying for the day, empty the fuel tank, start the engine and let it run until it quits. This will ensure that there isn't any fuel residue left in the engine. Squirt after-run oil into the carburetor and the glow-plug opening, and turn the prop manually several times to fully coat the inside of the engine with the protective oil. Before storing an engine for an extended period, remove it from your model, oil it well, wrap it in a cloth and place it in a sealable plastic bag for safekeeping.

How much fun we have when we fly our models is directly proportional to how well our engines behave. Taking proper care of them is the best way to keep them happy. It's time well spent and an investment that keeps paying us back.

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TROUBLESHOOTING

SYMPTOM	CAUSE	CURE
Engine doesn't start	Low voltage on glow-driver battery	Replace/recharge battery
	Bad glow plug	Replace glow plug
	Insufficient fuel prime	Repeat priming procedure
	Flooded owing to excessive priming	Remove plug, and rotate prop to clear cylinder of fuel
	Pressure lines and fuel lines are reversed	Remove fuel lines and reinstall them correctly
	Needle valve not set properly	Set adjustment needles to factory settings for starting
Engine starts and then quits	Idle set too low	Reset idle for higher rpm
	Low-speed needle is set too rich	Lean out low-speed mixture
	Low-speed needle is set too lean	Richen low-speed mixture
	Glow plug is loose	Tighten glow plug
	Glow plug is bad	Replace glow plug
	Mixture is too rich	Lean out main needle valve ½ turn
Engine bogs when full throttle is applied	Low-speed needle is set too rich	Lean out low-speed mixture
	Low-speed needle is set too lean	Richen low-speed mixture
	Glow plug is too cold	Install hotter glow plug
	Mixture is too rich	Lean out main needle valve
	Mixture is too lean	Richen main needle valve
Engine idles erratically	Air leak (hole) in pressure or fuel lines	Replace lines
	Low-speed needle set too lean	Richen low-speed mixture
	Bad glow plug	Replace glow plug
Engine doesn't reach full power	Mixture is too rich	Lean out main needle valve
	Mixture is too lean	Richen main needle valve

FUEL FILTERS

There has always been debate about whether or not to use a fuel filter between the model's tank and the engine's needle valve. For years, I've run my engines without an in-line filter, and I have never had a problem with fuel blockage. This is because I filter the fuel three times before it gets to the tank.

First, I use a sintered-bronze filter as the pick-up clunk in my main fuel jug. It prevents any large particles from leaving the jug.

Filtering your fuel greatly decreases the chances of having contaminants clogging a fuel line or getting into your engine.

After the fuel exits the fuel pump, it passes through a Sullivan Crap Trap, which removes any fine particles the first filter may have missed. The Sullivan filter has a transparent body and a fine mesh screen at both ends; you can see whether there is anything in the fuel.

The last filter I use is a Du-Bro Final Filter. It has two micromesh screens to remove the tiniest particles from the fuel. I use this filter between the fuel-pump line to the model's filler line. The filters are progressively finer, and this keeps out any contaminants that might be in the fuel.

To minimize the chances of your fuel becoming contaminated, change the pick-up lines in your jug twice a year. The nitromethane in the fuel can degrade the lines, and they are inexpensive to replace.

—Rick Bell

Fuselage structures and construction

Editor's note: guest columnist Dick van Mourik is a noted scale designer and competitor from the Netherlands, where he also serves as a judge in scale events.

The author's Zlin 526 AS is a good example of a model that uses several construction techniques to duplicate the aircraft's scale appearance.

Different types of scale model aircraft fuselages require different construction methods. Before you choose a method or combination of methods, first consider the functions you'll need it to perform. A scale fuselage needs to position the model's wing and empennage at a specific distance from each other, hold the engine, provide room for the radio gear and fuel tank and be able to cope with the forces acting on it during takeoff, flight and landing.

Another consideration—especially with girder construction—is to avoid stress points. Abrupt joints, as shown in Figure 1, concentrate stress forces in a small area and tend to break. Because of this, it is a good idea to distribute the forces; I use a triangular filling piece or a thin plywood gusset as shown.

It is nearly impossible to build a bulletproof model, and besides, the lighter the model, the smaller the forces acting on it will be. A low weight is achieved by keeping each individual component as light as possible. You'll be surprised at the results!

Having said that, let's take a look at five different fuselage construction methods:

■ **Basic girder (stick) construction.** This basic structure can be used by aircraft that have a square-section fuselage, such as many aircraft of the '30s, as well as recent homebuilts. Here, the outer surface of the girder construction is stiffened with thin sheeting and is used as the final shape in this form (see Figure 2). After you've positioned the half formers to form the turtle deck, you can plank them with single sheets of 1/64-inch-thick plywood or 3/32-inch-thick balsa (this avoids the hassle of using strips).

Advantage: simple; easy to build.

Disadvantage: can be used only for square-section fuselages.

■ **Basic girder with half-former sides.** This method is based on the same internal crutch previously mentioned, but half formers form the fuselage's final shape (see Figures 3A, 3B and 3C). The basic girder fuselage is easy to build and provides more than enough room for the engine, fuel tank and radio gear. The fuselage structure is cantilevered, so the outer sheeting (covering) is only cosmetic. This also implies that you can sheet the fuselage with thin (light!) materials, as the main structure can handle the flying loads. I use 1/16-inch-thick sheeting, even for bigger models. This construction is well suited to biplanes and lightplanes, and you can create fuselages that are curved all around by placing half formers all around the girder box.

Figure 1
Preventing stress risers by spreading the load

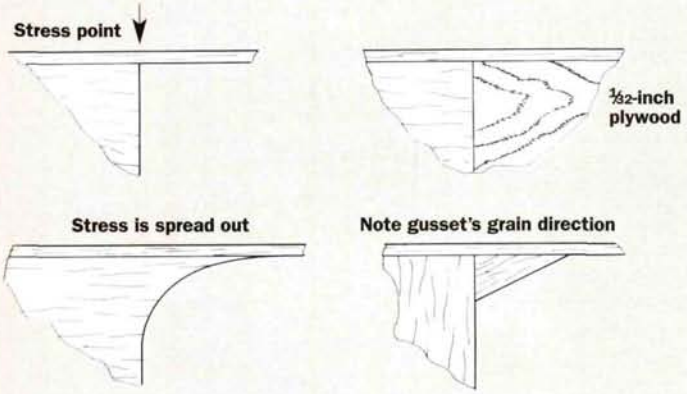


Figure 2
Typical flat-sided girder (stick) construction

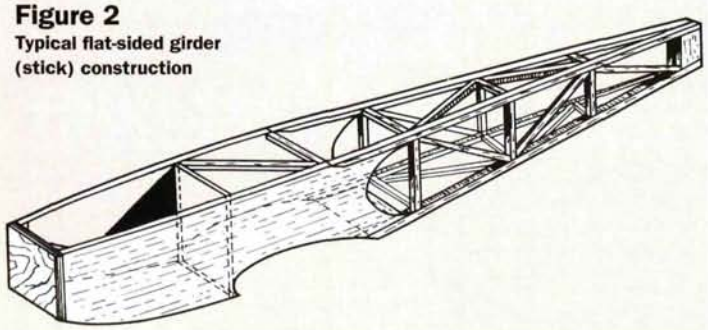
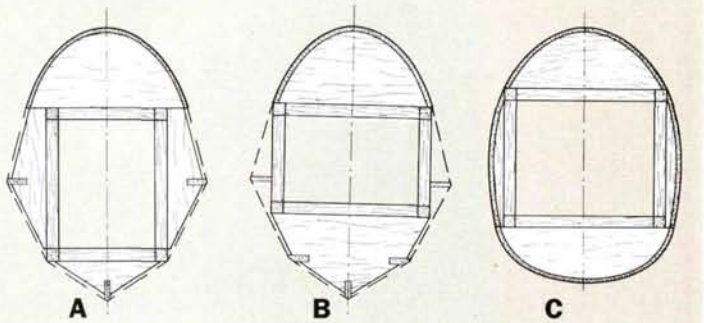


Figure 3—A, B and C
Girder construction with half formers



TECHNIQUE OF THE MONTH by Gerry Yarrish

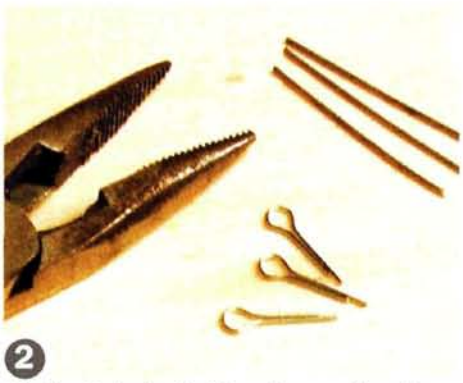
ENGINE-COWL CLIPS

On most scale models, it is all the small things that bring the model to life. Rivets, panel lines and screw heads are the things we always look for when we see a scale model for the first time. Often overlooked are items such as the simple but very obvious engine-cowl clips that hold the cowl panels in place. In the real world, these are solid posts that stick through holes in the cowl. A hole is drilled through the side of the post, and a wire clip is inserted into the post to hold the cowl in place. Typically, a washer is used between the cowl and the clip to prevent the cowl from chafing.

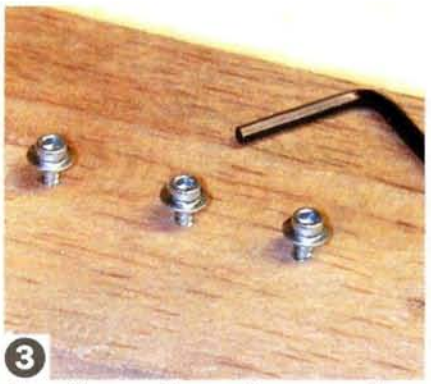
I found it very difficult to make and drill scale posts, so I came up with a really easy way to cheat and still make this nice little detail. Since there are usually several cowl clips on a model, my method will save a lot of time.

Cowl clips are a great way to dress up your model. Here you see the clips on my Piper L-4 Grasshopper.

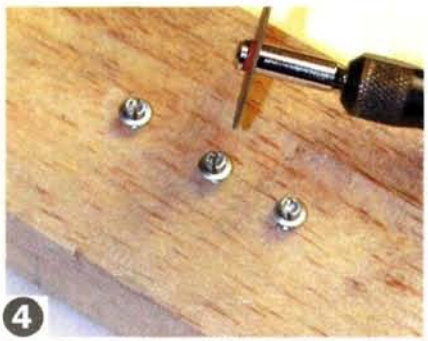
1 All you'll need are a couple of cap-head servo-mounting screws (available from Micro Fasteners), a couple of old RadioShack resistors, a pair of wire cutters, some Zap glue and kicker and a Moto-Tool with a thin cut-off disc.



2 Clip the wire leads off of the resistors and bend them to shape, as shown.



3 Use an Allen wrench to screw the servo-mount screws into a wooden base.

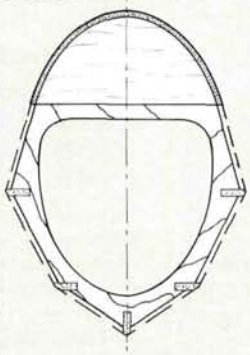


4 With a high-speed cut-off disc, cut slots across the face of the screws. Cut the slot down to the flared collar around the head.

5 Place the bent wire "clips" in the slotted screw heads, apply a drop of thick Zap to form a raised bead of adhesive and then mist with kicker to set the glue.

6 Now paint the cowl clip silver and drill a hole in the engine cowl where you want to install the clip. To secure it, glue the screw from the inside of the cowl and cut away the excess screw length. That's it; add a little rust-colored paint for an authentic weathered look, and you're done.

Figure 4
Classic former construction



Old hat but ideally suited to aircraft with unusual fuselage cross-sections

You can build nearly any warbird with this construction method, but a disadvantage is that the girders often cannot be constructed on the most outward sides of the fuselage and may interfere with having a fully detailed cockpit interior. This is why this method is often combined with the classic former construction (described next). In this case, everything aft of the cockpit section is constructed with girders, while the front part of the model is made differently.

Advantage: can be used for fuselages of almost any shape; lightweight.

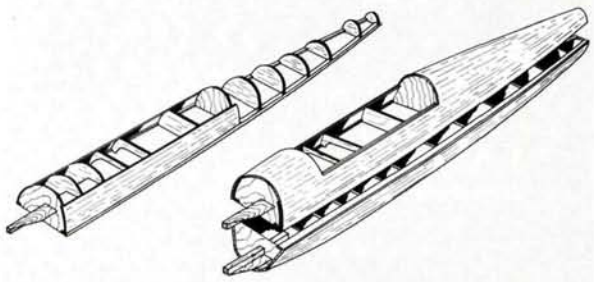
Disadvantage: labor- intensive.

■ **Classic former construction.** Often regarded as obsolete, this construction method can be used by a surprising number of models. One example is an aircraft with formers that are strongly tapered toward the top and/or bottom. In general, the formers are made out of plywood and then sheeted with balsa to form a cantilevered structure (see Figure 4). Note that the sheeting is needed to provide the strength here, so a thicker sheeting is called for (I use ⅛ inch). Because of the accuracy required when using this method, I usually make a jig to hold the parts while I'm building.

Advantage: can be used for every fuselage shape.

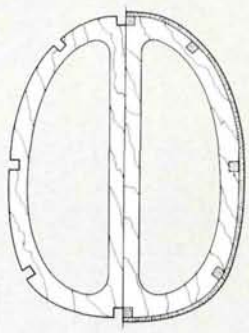
Disadvantage: not always easy to line up; you may need to build a jig to hold the parts.

Figure 5
Half-shell fuselage construction



The fuselage halves are each built flat over the plans and then joined to create the completed structure.

Figure 6
Half-shell construction variation



You can also build the fuselage in left and right halves.

■ **Split fuselage construction (half-shell method).** Here, the fuselage is split at a suitable place so the upper and lower (or right and left) fuselage halves are built flat on the drawing board (see Figure 5). This method is especially suited to models that have double-curvature fuselage sides, like many modern designs as well as many warbirds and sport models. It's useful when you need to construct a light model.

A variation of this method is to split the fuselage lengthways to form a left- and right-hand shell (see Figure 6). This construction is especially suited to models of larger aircraft, such as the Mosquito, Heinkel 111 and B-17. Also appropriate to many of today's civilian wide-body aircraft, this method allows you to build curved fuselages without using jigs.

Advantage: allows you to more easily build a double-curvature fuselage.

Disadvantage: high degree of precision required, especially when splitting the fuselage from top to bottom.

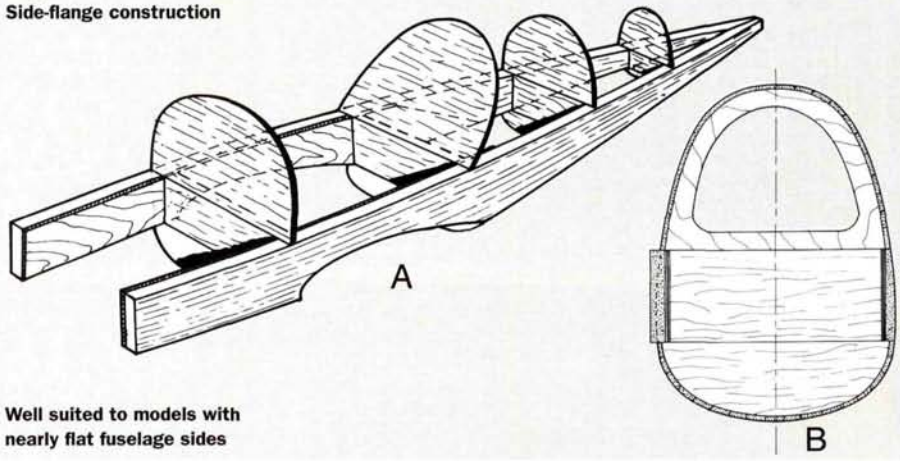
■ **Building using side flanges.** Used on P-51 Mustangs, Hawker Typhoons and many other similar models, this method is ideal for aircraft that have nearly flat fuselage sides. Such side flanges are made out of ¼-inch-thick balsa and are doubled with plywood on the inside. I usually use 1/64- to 1/32-inch-thick plywood for this, depending on the size of the model. The two sides are then used to construct a box-like fuselage. The upper and lower halves are formed with half formers (see Figures 7A and 7B).

Advantage: very easy to build; allows ample space for cockpit interiors, radio gear and fuel tank.

Disadvantage: labor-intensive, especially strip planking the formers.

Remember, one of the best ways to learn which construction methods work best with various aircraft types is to see what other successful designers have used. Look at plans, read magazine construction articles, and ask questions. Like many scale designers and builders, you may find that collecting plans is a hobby in itself!

Figure 7—A and B
Side-flange construction



Well suited to models with nearly flat fuselage sides

HOW TO

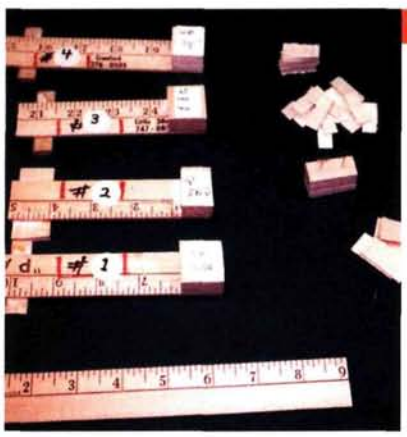
Shear Webs Made Easy

A quick way to add strength to your wing

by John Tanzer

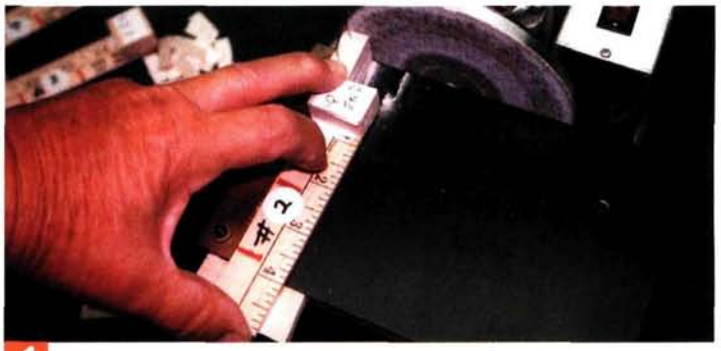
According to the experts, shear webs on wing spars are strongest if you install them between the top and bottom spars to form an I-beam between the wing ribs. This requires that all the webs be made to an exact size—not an easy task if you're making 50 or 60 of them, one at a time. And it's difficult and time-consuming to try to fit them into place after the wing is built. The best technique is to make a lot of them all at once and install them as you build the wing. I make a dozen at a time by stacking oversize blanks and then sanding them to shape using four homemade sanding gauges of various sizes on a disc sander equipped with a guide fence. The gauges allow me to make as many identical webs as I need. For my 38-inch-span Sopwith Camel project, I needed 60 1/16x3/8x1-inch vertical-grain shear webs, so here's what I did:

1 First, I cut 60 web blanks slightly oversize (1/16x1/2x1 1/8 inches; this allows room to sand them to the exact dimensions needed) out of balsa sheet. I then formed stacks of 12 blanks and secured each blank stack with a T-pin.



2 To make the four sanding gauges, you'll need approximately 24 inches of 1/8x1-inch wood; I made mine from a yardstick. Cut the length of wood into four, 6-inch-long pieces. Next, glue a block of balsa that is as high as the stack of 12 web blanks onto one end of each piece and then sand the balsa blocks square on the sander.

3 Gauge no. 1 will be used to square up the sides of the web stack, so slide the gauge 7/16 inch back from the sander disc and glue a 1/4x1/2-inch piece of balsa onto the bottom of the gauge to act as a stop. The rest of the gauges will be made the same way.

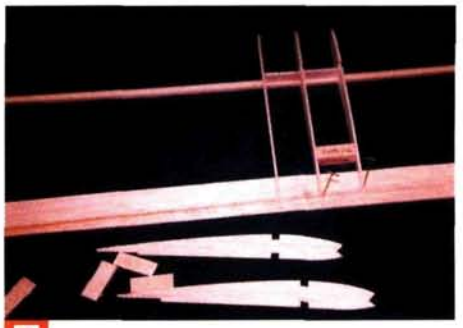


4 Slide no. 2 back 11/16 inch from the disc and glue on the balsa stick stop. This gauge will be used to square up the ends of the stack.

5 Slide no. 3 back 1 inch from the disc and glue on the balsa stop. This one will be used to sand the webs exactly to their 1-inch length.

6

To make no. 4, slide it back ⅜ inch from the disc and glue the stop on. This last gauge will be used to sand the webs to their ⅜-inch height.



7

Now it's time to install the webs. Pin down the main spar and the trailing edge; use a rib to get the right spacing between the spar and the trailing edge. Glue on the first rib, keeping it plumb and square with the spar and the trailing edge. Now glue on a web, then a rib, a web, a rib and so on.

To keep each rib straight, use a spacer at the trailing edge. If you do this all the way out to the tip, you can build the whole wing without using a wing plan. After you've glued in all the ribs and webs, glue in the top spar to form the I-beam.

Here is a look at the completed Sopwith Camel. The shear webs add considerable strength to the wings without detracting from the scale appearance.

Webs of any size can be made this way; just measure the height between the spars and the space between the ribs and then add ⅛ inch to both dimensions to allow for sizing with the sander. Try this technique on your next scratch-built plane; it is an easy way to get strong wings every time.

PRODUCT WATCH

AT *MODEL AIRPLANE NEWS*, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

PRECISION HOBBY TOOLS
Electro-File
Workshop wonder

This reciprocal in-line filing and cutting tool is a great addition to anyone's workbench. The Electro-File is powered by an electrical converter that can be plugged into any 120V 60Hz wall socket; a rechargeable, detachable battery-pack version is also available. Intended for light-duty use, the tool is ideal for craftsmen, hobbyists and model builders. It has a ¼-inch stroke length and reciprocates at 2,700 strokes per minute (2,400, under load). The hand-held power unit is about 10 inches long, and it is well-balanced to allow you the precise control you need. The unit accepts flat- and round-shank files and has a built-in wrench holder, and a convenient hanger for easy storage. A simple push-button activates the tool, and a locking switch makes changing a blade or file safe and easy (always unplug a power tool when you change the blade).

I found the Electro-File well suited to repetitive sanding and finishing jobs such as deburring metal attachment brackets. I was also pleased with how quickly and neatly it cut through thin plywood ribs right next to the spars where I wanted to install dihedral bracing. The basic unit costs $89.95 plus $7.25 S&H and is an excellent supplement to rotary cutting tools. For $129.95 the Electro-File is also available in a deluxe tool kit that includes accessories. Cutting blades and 10-piece file and rasp sets are also available separately. —*Gerry Yarrish*

Precision Hobby Tools, P.O. Box 195, Hubertus, WI 53033-9799; (877) 872-0924; www.precisionhobby.com.

Accessories include:

- **Needle files—⅛x5.5 inch and 1/16x4 inch (diameter x length)**
- **Needle rasps—⅛x5.5 inch (diameter x length)**
- **Diamond needle files—⅛x5.5 inch (diameter x length)**
- **Sanding paddles with self-adhesive sandpaper strips—⅛x5.5 inch (diameter x length)**
- **Cutting blades—¼x1/32 inch (width x thickness)**

LITE MACHINES
Micro-Starter
Simple startup

My first experience with Lite Machines was when I learned to fly helicopters. Building and flying that Lite Machines 100 convinced me that its products are first-class deluxe! The Micro-Starter definitely exhibits the same outstanding qualities. Even though it was designed specifically for .02 to .074 engines, it easily started one of my older .09 powerplants.

The Micro-Starter fits in the hand very well and features a large "squeeze switch" that increases your grip on the starter when it is in operation. It comes with three rubber inserts: one for a spinner, one for a prop nut and one for a helicopter. The inserts are easy to install and remove; one will be just right for any engine in the recommended size range. Be sure that the insert doesn't touch the prop; the wrong insert could abrade the center of the prop at high speeds.

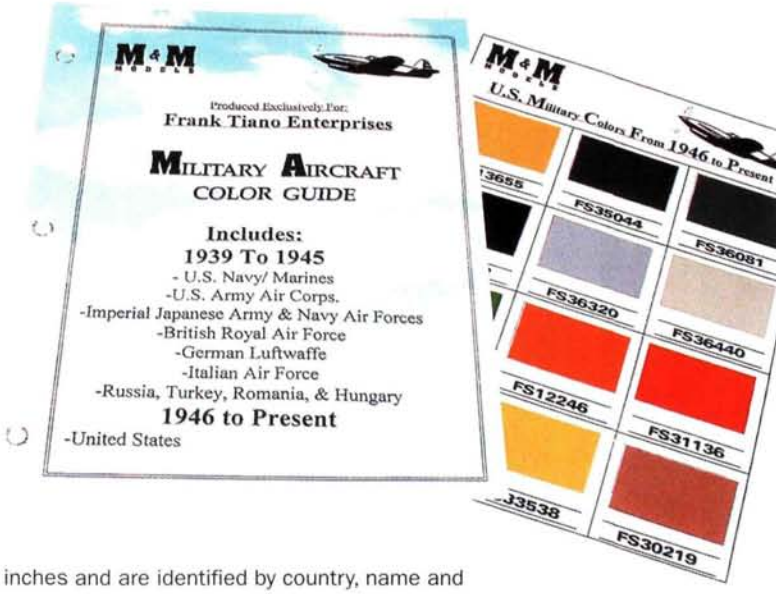
This unit uses a 12V power source; a car or motorcycle battery is recommended. A connector isn't provided, so you can attach alligator clips or the appropriate connectors to match your system. The battery leads are not color-coded, so once I had established polarity, I used red paint to mark the positive lead. The Micro-Starter costs $34.95. —*Randy Randolph*

Lite Machines, 1291 Cumberland Ave., Unit H, West Lafayette, IN 47906; (765) 463-0959; fax (765) 463-7004; www.litemachines.com.

M&M MODELS

Military Aircraft Color Guide

Ultimate scale reference



Produced exclusively for Frank Tiano Enterprises, M&M Models' "Military Aircraft Color Guide" is a must-have for any scale RC modeler. This documentation booklet includes large color chips endorsed by AMA scale contest board chairman Dave Platt. Each chip is an actual custom-mixed painted sample—not a printed reproduction. Information sources for these chips include: the Federal Standard Color Guide 595B, the British Standards Institute publication (BSI) 381 C, German RLM color charts and the Chicago Scale Masters Color Guide.

The chips are categorized for U.S. Navy/Marines, U.S. Army Air Corps/USAF, Japanese Army/Navy, British Royal Air Force, German Luftwaffe, Italian Air Force and the aircraft colors for Russia, Turkey, Rumania and Hungary. All color chips measure 1¼x2 inches and are identified by country, name and number. The new M&M guide also includes two pages of U.S. military colors used from 1946 to the present day.

The booklet has a clear cover, and all of the eight 3-hole-punched pages are printed on card stock, and are removable to allow you to use them in your model's documentation presentation.

If you need a ready source for easy-to-use color clips for your next modeling project, or if you're just looking to expand your scale-documentation library, the newest M&M Military Aircraft Color Guide ($38) is an investment that will pay big dividends. *—Gerry Yarrish*

M&M Models; distributed by Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414; (561) 795-6600; www.franktiano.com.

PACER TECHNOLOGY

Fiber-Poxy

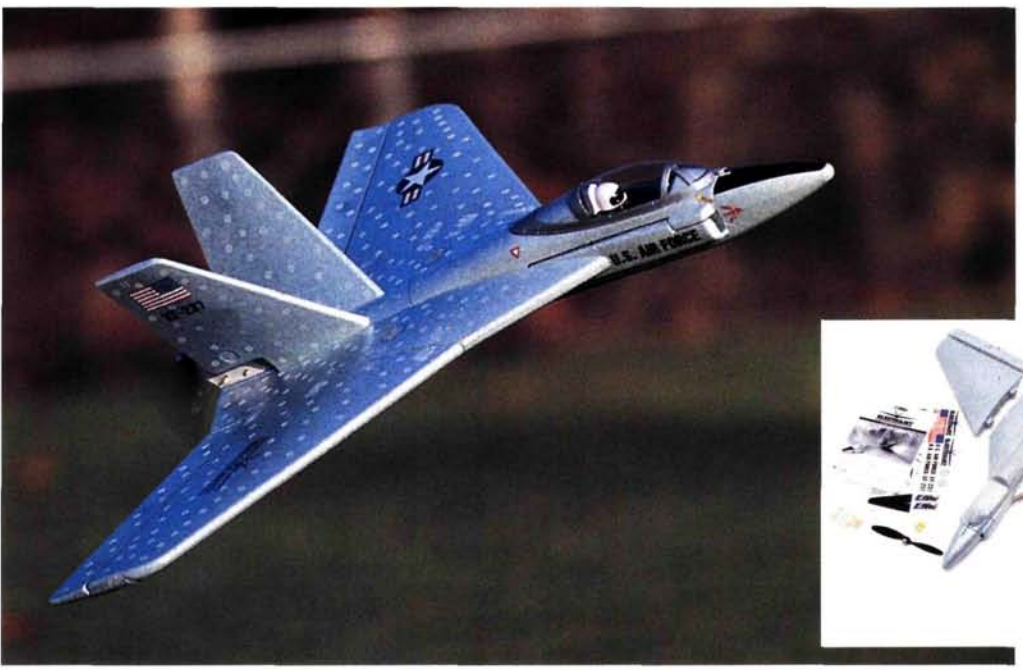
Quick fix

Fiber-Poxy is an industrial-strength, quick-setting, two-part adhesive that is specifically formulated to work on polyester and epoxy/resin fiberglass surfaces. Distributed by Pacer Technology, Fiber-Poxy comes in a dual-action dispenser that automatically delivers equal amounts of parts A and B. The adhesive allows about 8 minutes of work time before it begins to set up, and it is fully cured in 24 hours. Fiber-Poxy is waterproof, remains flexible, and seals tightly against smooth surfaces; it can be used to fill gaps. Use it to glue metal, glass, concrete, ceramics, and other household materials. I used Fiber-Poxy to install plywood formers in a fiberglass fuselage, and though it has a very strong odor (use in a well-ventilated area) it is perhaps the best adhesive I have ever used for this purpose.

Priced at $4.99, Fiber-Poxy is ideal for shop use and to keep in your field box as a repair adhesive. Give it a try; you'll find it useful for hundreds of gluing applications. —*Gerry Yarrish*

Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730; (909) 987-0550; (800) 538-3091; fax (909) 987-0490; www.pacertechnology.com.

Be the neighborhood jet-jock



You just watch; this backyard-flyer phenomenon will prove to know no bounds. We modelers will soon be able to enjoy all types of airplane subjects within the confines of small, close-to-home flying spaces. If you've come to believe that schoolyards and softball fields are solely the realm of Cubs and biplanes, you need to take a closer look. For example, take a look at E-flite's Electrajet, featured in this column.

ABOUT THE MODEL

The Electrajet is a cool-looking, 380-geared pusher design (reminds me a little bit of a Navy Chance Vought F7 Cutlass—sort of) that's constructed of all foam. The foam structure, by the way, gives rise to an airframe that is surprisingly resilient on rough landings. And here's the best part: although this model does have brisk performance to match its sleek, jet-age appearance, it can be slowed way down and turned tightly in relatively small spaces. The pilot just can't be shy about applying throttle and cranking in lots of up-elevator during one of these tight turnaround procedures. These flight characteristics are because of the delta-wing configuration that won't tip-stall; it hangs in there with lift right down to a crawl. Oh, yeah—this is a model with two "best parts"! The second is that it can be built—at a relaxing pace, mind you—in less than half a day.

IN THE BOX

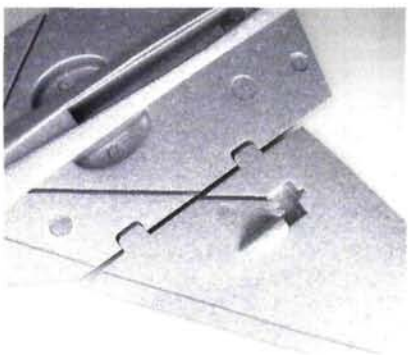
The Electrajet costs about 150 bucks at your local hobby shop, and that represents a pretty good value when you learn what's included. Of course, you'll find all the necessary injection-molded parts, hardware, an instruction booklet and decals. But also in the box are a 380 motor with a gear-reduction drive system; a 16A, 6- to 10-cell electronic speed control and—get this—a delta-wing electronic mixer! That's right; you don't have to use a transmitter with an elevon-mixing feature with this model. The mixer, along with everything else, is included with the kit. All you need to buy is any basic 3-channel radio with two micro-servos and the onboard, 8-cell, 700mAh battery pack. I like complete packages, and this one gives you a lot.

BUILDING

An in-depth review on the Electrajet, authored by our in-house master craftsman, Gerry Yarrish, will be published

JR QUATTRO LITE

This is JR's Quattro Lite system. The "Lite" means you get an R610M 6-channel micro receiver and two NES-241 microservos with the airborne pack. I've used this system in many tiny models and have never had a problem. If your park flyer requires four channels, this system is the way to go. If you don't wish to purchase the transmitter, the micro-airborne pack is available individually (minus the crystal) and is called the Airpac Micro, item no. JRPF640. The entire Quattro Lite system sells for $124.95.



This photo clearly shows how the wing panels accurately key into the fuselage. This exemplifies the good parts fit and fine construction techniques that are evident throughout the Electrajet. Note also the high-quality parts molding.

in our next issue of *Backyard Flyer*, so I'll just touch on a few things here. First of all, the model goes together with an extremely accurate fit that's almost foolproof. The photo shown on the preceding page of the wing and fuselage keying together tells the entire assembly story of this model. In short, the model is a breeze to get ready for some close-to-home fun flying. Simplicity of assembly notwithstanding, a detailed, 15-page instruction booklet with 57 photos is supplied with the kit to ensure success. Gerry recommends one deviation from the instructions' assembly process: he says to install the motor and gear drive before, not after, you've glued on the two vertical stabs. Leaving them off until later gives you far more room to work when you install the drive unit. Our Electrajets were assembled entirely with 5- and 10-minute epoxy. Working diligently, you can assemble the model in 3 to 4 hours. Working lazily, which is how I like to work, you can complete it in 5 to 6 hours.

FLY FAST OR FLY SLOW; IT DON'T MATTA

The reason I decided to tell you guys about this model in my column is because of the way it flies. It flies fast—it flies slow—it flies great! This design really does possess the best of both worlds. Whether it's "ground attack"-style, high-speed low passes at full throttle or "carrier landing"-style, nose-high slow flight that turns you on, the Electrajet does both well—very well. The slow-flight characteristics of that delta wing are unbeatable. It's almost impossible to stall. With the controls set up to maximum, the Electrajet will do axial rolls; no problem. The overall flight envelope of this model is so enjoyably wide that I think the airframe is well worthy of a brushless-motor upgrade. It's just that good. But that's a subject for a future installment of this "Backyard Flyer" column.

These electronics are all included in the kit. Clockwise from top left are a 380 motor bolted to the 1.85:1 gear-drive box; a 16A, 6- to 10-cell speed control and a delta-wing/elevon electronic mixer. The latter plugs into the elevator and aileron receptacle on the receiver and into the two servos that control the Electrajet's elevons—a very clean and reliable setup.

Helical-cut metal gears and an output shaft supported at both ends by ball bearings; now that's going the extra mile, in my opinion. Most stock gear drives supplied with kits incorporate cheaper, straight-cut gears, often made of plastic. Not so with the Electrajet—thank you!

CONCLUSION

Park flyers, backyard flyers, schoolyard flyers—whatever you want to call these new, tiny planes, the trend toward them is growing at a phenomenal rate, and all kinds of products are being rushed to market—some of them good, and some of them not so good. This always happens at the beginning of a new market explosion. To help you guys find the truly great stuff, I try to cover only what is worthwhile. And I can tell you that the new E-flite Electrajet is good—very good. It's a terrific value, it goes together accurately, and it does what the manufacturer claims it will do: it flies great! I wholeheartedly recommend E-flite's Electrajet. ✈

E-flite; distributed by Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; fax (217) 352-0355; www.horizonhobby.com.

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NAME THAT PLANE

Can you identify this aircraft?

SEND YOUR ANSWER to *Model Airplane News*, **Name that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

The winner will be chosen, four weeks following publication, from correct answers received (delivered by U.S. mail) and will be awarded a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will be given a free, one-year subscription extension.

Stan Zdon of Coon Rapids, MN, won January's "Name that Plane" contest by correctly identifying the mystery plane as the Aero-Flight Streak. Congratulations, Stan. Produced in three versions between 1946 and 1953, the Streak was a two-seat, low-wing, experimental lightplane with an all-metal construction and tandem dual control. The trim, fighter-type aircraft was specifically designed with faster features to extract the most performance out of a given engine. The AFA-2 Streak-125 (pictured here) was powered by a 125hp Continental C125 engine. Other versions included the AFA-1 Streak-85, powered by an 85hp Continental C85-12J engine, and the AFA-3 Streak-165, powered by a 165hp Franklin engine. The full-size Streak appeared on the cover of the July 1948 issue of Model Airplane News accompanied by a full article.

▼

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Airborne Video Systems, 142
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AirBorne Models, 48-49
Airplane Factory, 151
Airtronics, C3
America's Hobby Center, 130
Arizona Custom Builders, 134
Autogyro, 136
BMJR Model Products, 139
Backyard Flyer subscription, 99
Bob Smith Industries, 35
Byron Originals, 33
C3GM Sidewalk Flyers, 140
Carlson Engine, 134
Castle Creations, 47
C.B. Tatone, 140
Century Helicopter, 73
Century Jet Models, 148
Cermark Models, 26, 137
Chase-Durer, 9
Chief Aircraft, 74-75
Clark Industries, 150
Cleveland Model & Supply Co., 142
Cyberbond, 97
D&L Designs, 148
Dave Gierke, 149
Desert Aircraft, 133
Don Smith, 136
Doppeldecker, 143
Du-Bro Products, 65
Dymond Modelsports, 90-91
Ebay, 105
Electro Dynamics, 148
Erickson Motors, 142
Esprit Models, 108
Eurokit North America, 139
Fiberglass Specialties, 149
Florida Jets, 83
FMA Direct, 103
Fox Mfg., 27
Fuji, 41
FunAero RC, 152
Futaba, 55
Georgia Aircraft, 135
Giantek, 148
Global Hobby Dist., 3, 15
Great Planes MF, 5, 79
Hangar 9, 23
Heritage R/C, 142
Hitec RCD, 19
Hobbico, 63
Hobbies & Helis, 95
Hobby Horse, 126
Hobby Lobby Intl., 127-129
Hobby People, 58-59
Horizon Hobby Inc., 6-7, 84-85
Identity Checks, 107
JK Aerotech, 152
JR, 11, 21
K&S, 134
K&B, 144
Kangke USA Inc., 50
Kyosho, 45
Lanier RC, 51
Mach 1 Hobbies, 143
Markey's Hobby, 125
MaxCim, 152
Maxx Products, 131
Megatech, 57
Micro Fasteners, 138
MicroPilot, 150
Midwest Products, 123
Miller R/C, 151
Model Covering, 138
Model Rectifier Corp. (MRC), C2
Morgan Fuels, 39
Mr. Ni-Cd Batteries, 104
MTM Intl., 143
Nelson Hobby Specialties, 134, 150
Northeast Screen Graphics, 149
Norvel, 72, 82
Omni Models, 101
On Top of the World, 140
O.S. Engines, 93
Pacific Aeromodeler, 138
Package Power, 138
Page Aviation, 151
Peak Electronics, 149
Planrite Trading Co., 81
Powermaster Hobby Products, 151
Precision Hobby Tools, 143
Precision Micro Electronics, 148
Propwash Video, 152
Quantum Models, 119-121
Raceplanes, 141
Richmond RC, 115
RC Showcase, 144
RCstore.com, 145-147
RCV Engines Ltd., 117
Robart Mfg., 123
RTL Fasteners, 152
Sig Mfg., 116, 134
Sky Hooks & Rigging, 143
SKS Videos, 150
Slimline Products, 12
Smiley Antenna Co., 141
Smithy Co., 150
Southern Balloon Works, 150
Stalker Radar, 151
Sullivan Products, 13
Swanson Associates, 151
TechnoPower Engines, 152
TNT Landing Gear, 144
Top Gun, 67
Tower Hobbies, 109-113
Trick R/C, 71
Tru-Turn, 141
Turnkey RC, 149
Universal Laser, 148
US AirCore, 25
Vinylwrite Custom Lettering, 123
Widget Supply, 144
Williams Bros., 140
Windsor Propeller Co., 139, 143
WRAM Show, 118
Zap, 17
Zurich, 133

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BY MATT BOYD

NASA's inflatable wings

The I2000 is carried with wings stowed on the belly of its RC-guided deployment plane to a drop altitude of 800 to 1,000 feet.

After the drop, the I2000's wings are inflated in about ⅓ second via an onboard compressed-nitrogen source. With wings deployed, the I2000 is flown safely to the ground like an RC glider.

NASA's Dryden Flight Research Center is at the forefront of full-size aerospace development. During the course of their experiments, Dryden researchers often use RC models, and that puts them on the leading edge of our hobby as well. A case in point is the I2000 inflatable-wing project. Inflatable wings themselves are not a new idea, but renewed interest in the concept has been generated in light of recent developments in unmanned research craft. The chief advantage is packaging; when deployed, inflatable wings provide lift comparable to that of conventional solid wings, but prior to deployment, they can be stored in a fraction of the space required for a solid wing. This makes them ideal for survey and planetary research aircraft projects, where space is at a premium.

The inflatable-wing team approached the problem in stages. First, they built a test model using a solid wing with the same dimensions as the inflatable wing would have. This proved that the airfoil shape was viable. Next, they flew the I2000 with the inflatable wing but pre-inflated it to eliminate the risk of a deployment failure. Once they established that the wing worked, all that was left to do was to prove that it could be deployed in flight. They did this by dropping the I2000 glider from the bottom of the specially designed deployment plane at altitudes of 800 to 1,000 feet. Both planes performed just as expected; the I2000 was piloted safely to the ground by Tony Frackowiak of Dryden's in-house model shop, who also built the various RC craft used in the project.

A key to the wing's success is its deployment speed; the wing goes from fully stowed to fully extended in about ⅓ second. Each wing is a separate unit; when compressed, each is about the size of a small coffee can. Inflated, each measures approximately 2.7 feet, yielding a wingspan of about 5.5 feet. An onboard nitrogen source compressed to 1,800psi inflates the two wings to their in-flight pressure of 180 to 200psi—enough pressure to allow the 15-pound I2000 to perform maneuvers at up to 3G.

To withstand the pressures and stresses, the wings are made by Vertigo Inc. from a high-pressure material called Vectran. They were originally developed, under subcontract from the U.S. Navy, for use on a gun-launched vehicle to enhance its glide characteristics.

The next step in the project will be to equip a 4-foot model of NASA's X-24A lifting-body vehicle. The X-24A makes a good next subject because it has an extensive aerodynamic database from which to draw. A wingless design, the X-24A can demonstrate the advantages in range and lower landing speeds that inflatable wings can provide.

The benefits should be equally enticing to RC aircraft modelers. Inflatable wings represent a nearly weightless method of producing lift, and because they require no internal structure except air pressure, there is essentially no building to be done. Certainly, the pressures involved require a durable material, which may be hard to obtain or afford in the short term, but the success of the I2000 project proves that there is great potential for inflatable wings. ✈